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ember 1947

Chemical Industries

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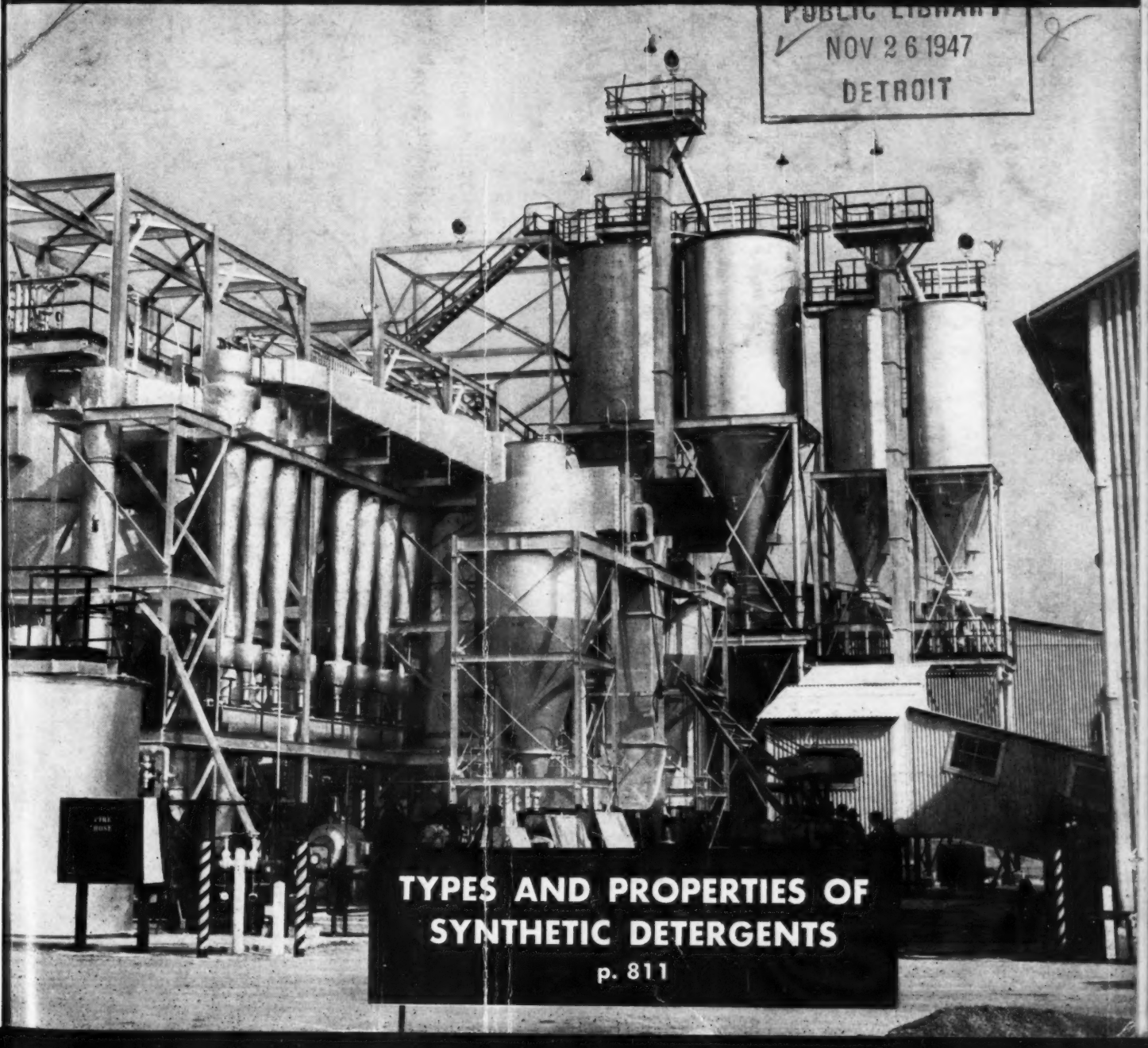


TYPES AND PROPERTIES OF SYNTHETIC DETERGENTS

p. 811

FIRST NAME IN QUALITY

SOLVAY

TRADE MARK REG. U. S. PAT. OFF.

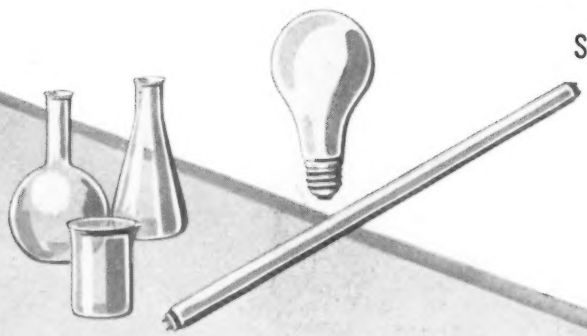
PRODUCTS FOR THE GLASS INDUSTRY

Ammonium Bicarbonate

Potassium Carbonate

Caustic Potash

Soda Ash



SOLVAY SALES CORPORATION

Alkalies and Chemical Products Manufactured by The Solvay Process Company

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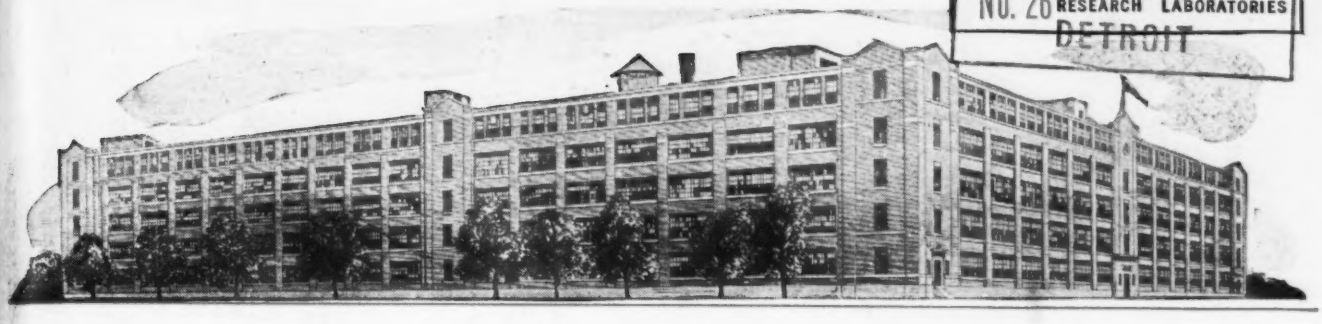
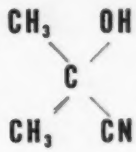
No. 26 OF A SERIES FROM CYANAMID RESEARCH LABORATORIES



Aero* Acetone Cyanohydrin



another "Cyanamid" nitrile

Acetone cyanohydrin has long been utilized as an intermediate in the manufacture of methacrylate resins. Potentially valuable as an organic intermediate in many fields—surface active agents, pharmaceuticals, plasticizers, insecticides—it is now available for application research in your own laboratories.

Representative of the many interesting reactions of this nitrile are:

DEHYDRATION

$$(CH_3)_2C(OH)CN \xrightarrow{-H_2O} CH_2=C(CH_3)-CN$$

ACETYLATION

$$(CH_3)_2C(OH)CN \xrightarrow{+CH_2=CO} (CH_3)_2C(CN)-OCOCH_3$$

BENZOYLATION

$$(CH_3)_2C(OH)CN \xrightarrow{C_6H_5CO\,Cl} (CH_3)_2C(CN)OCOC_6H_5$$

REACTION WITH AMINES

$$(CH_3)_2C(OH)CN \xrightarrow{(C_2H_5)_2NH} (CH_3)_2C(CN)N(C_2H_5)_2$$

References to these reactions and a number of others are contained in our technical data sheet. We suggest you complete the coupon below to obtain a sample and data sheet. Inquiries for commercial quantities and prices will receive our prompt attention.

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ACETONE CYANOHYDRIN

Colorless Liquid

m.p.	−19°C.
b.p.	82°/23 m.m.
sp. gr.	0.932/19°

Solubility

Water	v. sol.
Alcohol	v. sol.
Ether	v. sol.
Pet. ether	sl. sol.

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Unsaturated nitrile
Acrylonitrile $CH_2=CH\,CN$

α—Hydroxy nitriles
Glycolonitrile $HO\text{-}CH_2\text{-}CN$
Lactonitrile $CH_3\text{-}CHOH\text{-}CN$

β—Hydroxy nitrile
Ethylene cyanohydrin
$HO\text{-}CH_2\text{-}CH_2\text{-}CN$

β—Alkoxy propionitrile
β—Isopropoxypropionitrile
$(CH_3)_2\,CH\text{-}O\text{-}CH_2\text{-}CH_2\text{-}CN$

β—Halopropionitrile
β—Chloropropionitrile
$Cl\text{-}CH_2\text{-}CH_2\text{-}CN$

Dinitrile
Succinonitrile
$NC\text{-}CH_2\text{-}CH_2\text{-}CN$

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WON'T DEGRADE PULPS, FATS OR FIBERS

When most standard bleaching agents have oxidized up to a certain point—comes the attack! Fibers are tendered; pulps lose strength; fats revert . . . further bleaching must stop, or be subject to close, costly control.

It's a different story with Mathieson's Sodium Chlorite—and its co-product Chlorine Dioxide—the new bleaching agents which do not degrade pulps, fats or fibers, and hence permit safe bleaching to new highs in whiteness.

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Liquid Chlorine . . . Ammonia, Anhydrous & Aqua
HTH Products . . . Fused Alkali Products . . . Dry Ice . . . Carbonic Gas . . . Sodium Methylate

WHITE COTTON WITH STRENGTH

Cotton fibers, when bleached with Mathieson's Sodium Chlorite (Textone) and hypochlorite, are not attacked. Thus better whites are possible with no loss of tensile strength . . . solutions need only slight control.

HIGH BRIGHTNESS IN PULP

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UPGRADING FATS NOW EASY

Lower grade fats are easily improved to a quality suitable for high-grade soaps, by bleaching with Mathieson's Chlorine Dioxide. No deterioration . . . improved color and odor . . . much higher yields.

Sodium Chlorite—a Mathieson development—is a stable chemical which is used directly for many bleaching and oxidizing purposes . . . or used in conjunction with hypochlorite . . . or as a convenient source of the powerful oxidizing agent, Chlorine Dioxide. Details on the many applications are yours for the asking. Write to: Sales Development Department, The Mathieson Alkali Works (Inc.), 60 East 42nd Street, New York 17, New York.

Chemical Industries

"SERVING THE CHEMICAL PROCESS INDUSTRIES"

VOLUME 61—NUMBER 5 NOVEMBER, 1947

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Borden's Chemical Venture
Outlook for Antimalarials
Low Cost Cryostat
Nevada's Chemical Progress and Prospects
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THE READER WRITES

Fruitful File

To the Editor of Chemical Industries:

As a regular subscriber to your worthy magazine, I am always interested in the section, such as appears in the Sept. 1947 issue, on "New Chemicals for Industry." I clip these, stick them to cards and make a very handy file. No doubt, others do the same.

However, you have "fouled" me up, in a few cases, by printing these listings on each side of the same sheet, such as pages 431 and 432 of this issue, and in one or two other cases.

I would like to receive another copy of the September issue, or if you have prepared a booklet for the Chemical Exposition that carried this list that will serve my purpose.

Perhaps another time you will print the list so my trouble will not occur.

GARRETT B. JAMES, SR.
458 Pasadena Ave.
Webster Groves, Mo.

We regret that mechanical problems prevent our printing "New Chemicals for Industry" in the form Mr. James would prefer. However, realizing that other readers who keep card files may also have been inconvenienced, we have reserved a few extra copies of the New Chemicals feature. The supply is limited; first come, first served.—EDITOR.

Setting the Record Straight

To the Editor of Chemical Industries:

Undoubtedly you have received many compliments on your third annual survey of new chemicals and equipment, presented in your September issue. I have heard favorable remarks about it here at Allis-Chalmers, too.

However, I think you would like to hear of inaccuracies in your material, such as has been pointed out to me by one of our engineering departments.

Reference in question is to the listing of the Allis Chalmers Pedrifugal Pump, listed on Page 411. Under "Limitations," it is stated that the pump "cannot be used continuously.

Since you specifically list applications for "large Diesels, machine tools, air conditioners, heat exchangers and cooling towers," the expressed limitation is not true. While continuous operation of the Pedrifugal Pump might not be recommended in certain machine tool applications, it is quite possible in the other applications mentioned. Handling certain special material (in applications not listed), might also necessitate limited operation.

However, in the manner it has been included, the limitation reported is inaccurate.

N. H. JACOBSON,
Allis-Chalmers Manufacturing Co.
Milwaukee 1, Wis.

Information and Guidance

To the Editor of Chemical Industries:

I am a comparatively new subscriber to your valued publication, but nevertheless, the information and guidance I have already obtained through its pages have already been of such practical benefit to me that I felt obligated to express my appreciation.

Particularly do I wish to mention the various calls I have made on you and members of your staff for supplementary advice and information, and the courtesies and consideration (not to mention patience) that have been extended to me on every occasion.

It is certain that as my presently small enterprise progresses and expands, I shall find CHEMICAL INDUSTRIES of increasing benefit and value.

Please accept this as a sincere expression of thanks and appreciation to you and the members of your staff for the courtesies and cooperation I have received.

FRANK J. HUBER
208 W. 23rd St.
New York 11, N. Y.

Reader Huber's kind remarks are appreciated. CI's editors always welcome the opportunity to be of service.—EDITOR.

Research Reprints

To the Editor of Chemical Industries:

Please advise the earliest possible shipping date for the reprint in booklet form of the series entitled "Information Sources for Chemical Market Research." We would like this booklet as soon as possible.

F. KLEIN
Lucidol Division
Novadel-Azene Corp.,
Buffalo 5, New York

The booklet on the series of articles entitled "Information Sources for Chemical Market Research" was scheduled to be published in November of this year, but because of unavoidable circumstances and the printing of the supplements to Chemical Industries for the San Francisco and New York Chemical Expositions, we have had to hold up the printing until the first of the year. Therefore, we expect that copies should be ready for mailing at the end of January or early February of 1948.—Editor.

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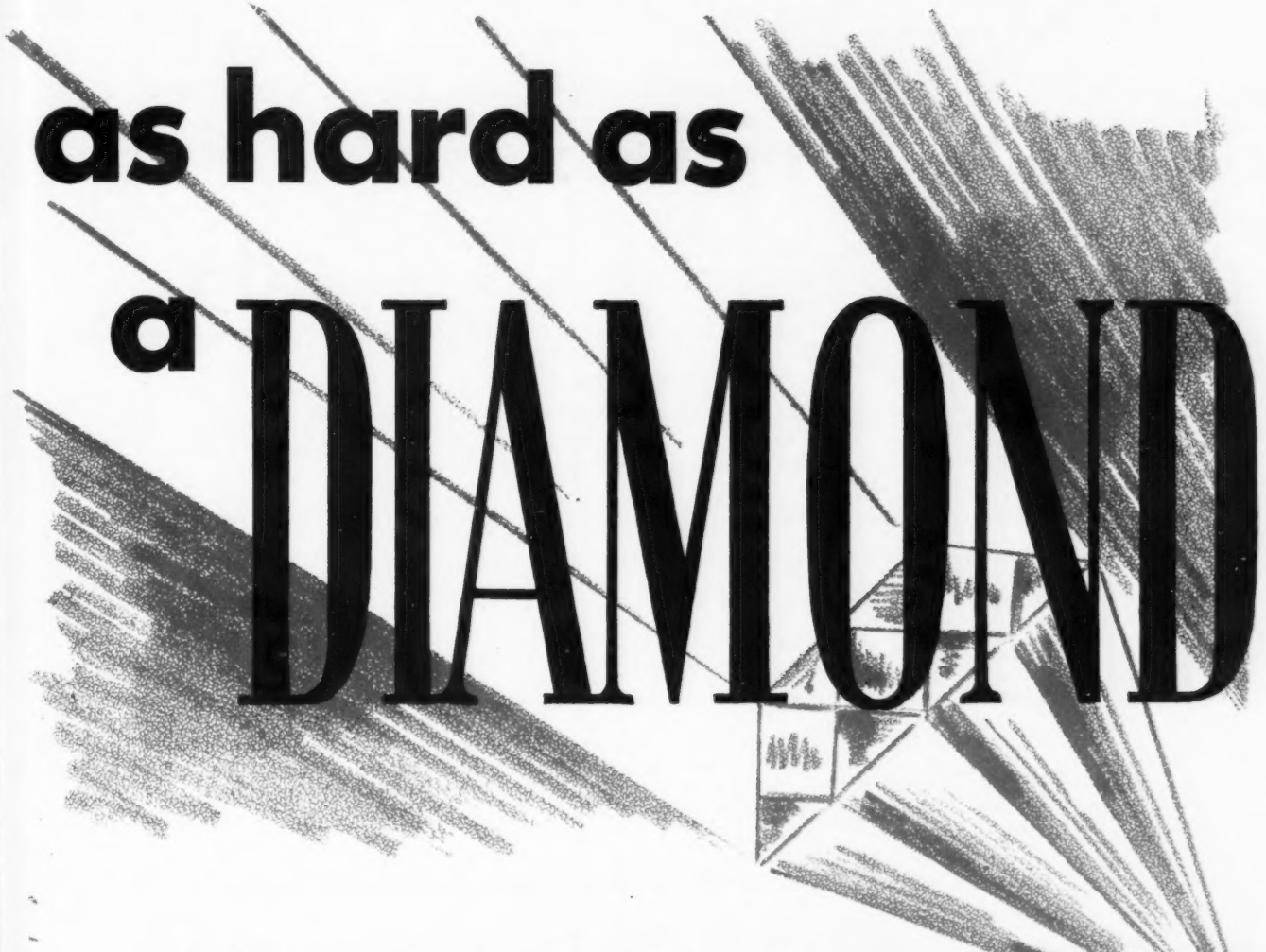

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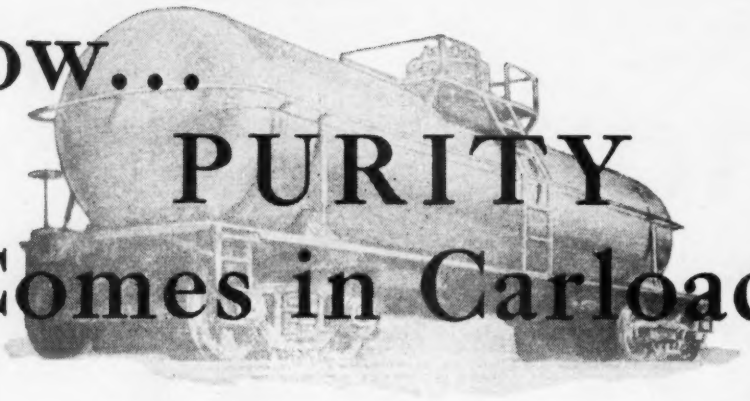

For the first time, Sorbitol is available in carloads—with a new concept of purity—for new uses and new thinking.

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- **FOR GENERAL INDUSTRIAL EMULSIONS**
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At this same booth you will find Kerazon, reinforced plastic for upholstery—Duranite H, new synthetic heat-curing finish for metals—Rockmaster Blasting System, for greater rock breakage with less noise and vibration—and Darco activated carbons for chemical purification.

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Sp. Gr. 20/20°C.	0.7915—0.7930
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Color APHA	5 max.
% Acid as acetic	.002% max.
Alkalinity as NH_3	1 ppm max.
Non-volatile	Max. .001 gr. per 100 cc sample
Permanganate time	2 hours min.
Aldehydes	None
Water	Less than 0.5% (miscible with 19 vol. 60° Be' gasoline at 20°C.)

For samples and any additional technical data desired, write to Celanese Chemical Corporation, a division of Celanese Corporation of America, 180 Madison Avenue, New York 16, N.Y.

SEVEN NEW CHEMICALS

Here are the seven New Chemicals announced by Celanese in recent months. Some of them are already in volume production.

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Methylal

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Methyl Ethyl Ketone

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Methyl Pentanediol

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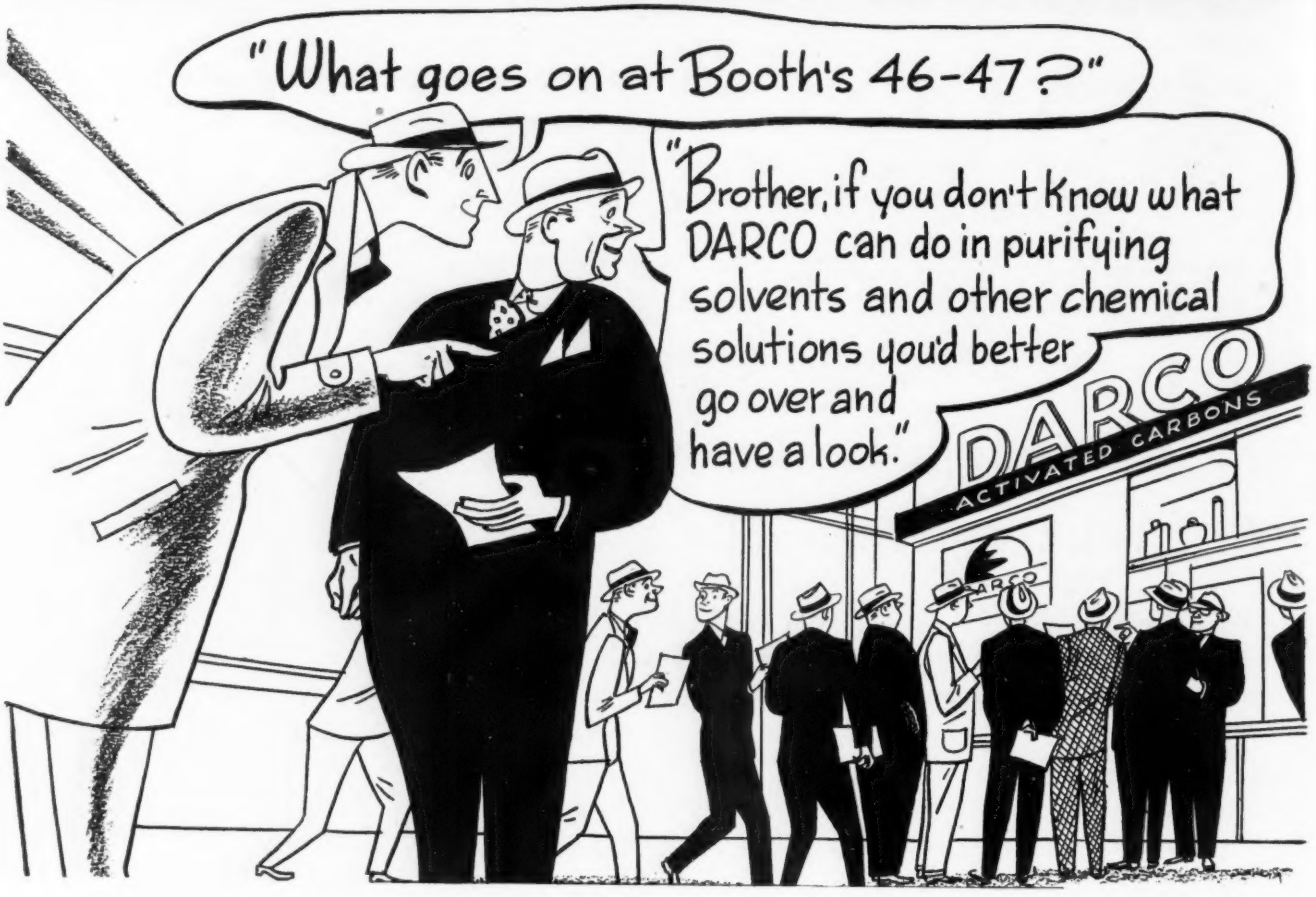
Booths 46-47 — New York Chemical Show


"What goes on at Booth's 46-47?"
"Brother, if you don't know what DARCO can do in purifying solvents and other chemical solutions you'd better go over and have a look."
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—And you will find that look well worth while. Darco activated carbons have a number of uses in which their purity, high adsorptive capacity, maximum filterability and low retention loss are valuable assets. These characteristics make for highest efficiency in four specific uses:

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② *Color, Odor and Colloid Removal*

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③ *Concentration by Adsorption and Elution*

Streptomycin is being concentrated in large scale operation by adsorption on Darco G-60, followed by elution (desorption) with a small volume of suitable solvent.

The principle of this concentration process is being studied for the recovery of other organic products, and indicates a large new field of use for activated carbons.

④ *Catalyst and Catalyst Carrier*

The enormous surface presented by activated carbon has led to its use in many catalytic processes. Both powdered and granular grades are used in this field.

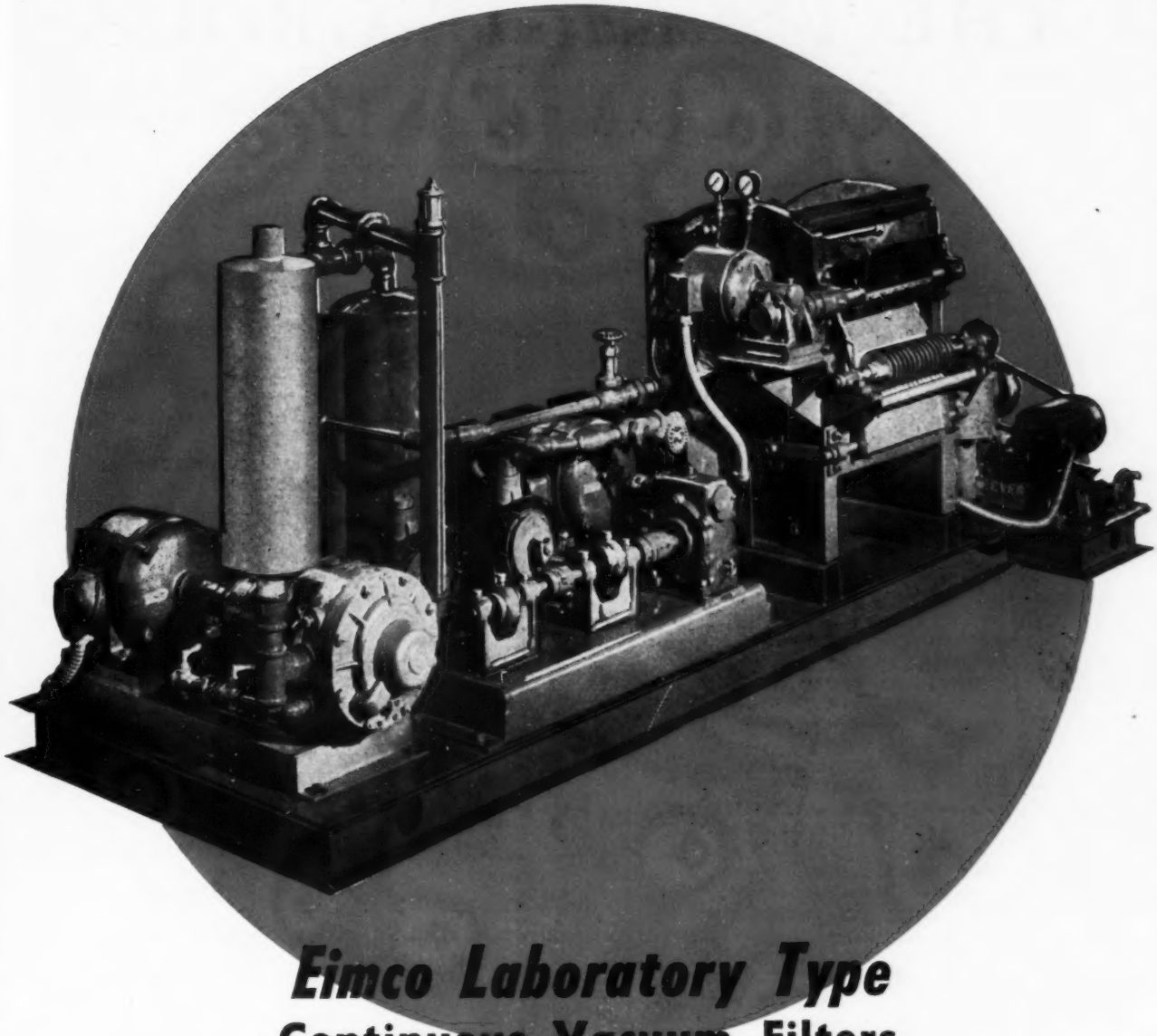
Carbon may promote reactions by concentrating the reagents at its surface, or it may be used as a base for metal and metal oxide catalysts. Platinum and palladium on Darco G-60 are successful illustrations of this use.

DARCO

DARCO—REG. U. S. PAT. OFF.

DARCO CORPORATION

60 East 42nd Street, New York 17, N. Y.



Eimco Laboratory Type
Continuous Vacuum Filters

On display at the 21st Exposition of Chemical Industries
Booth 605, Grand Central Palace, New York, Dec. 1-6, 1947

Laboratory data on filterability of a product can be definitely determined on the Eimco Laboratory Type Filter Unit. These small compact units are available as either drum or disc units and with all necessary operating equipment mounted on a fabricated steel subbase or the bare filter unit can be purchased separately.

Reliable data can be obtained from these units in the lab because they are proportionately constructed with regard to Eimco's larger production units of continuous vacuum filters.

Eimco laboratory continuous vacuum filters are made of stainless steel, monel and many other materials to meet the demands of processing plants or independent laboratories. These filters can also be equipped with flappers and scoring devices, as shown, if desired.

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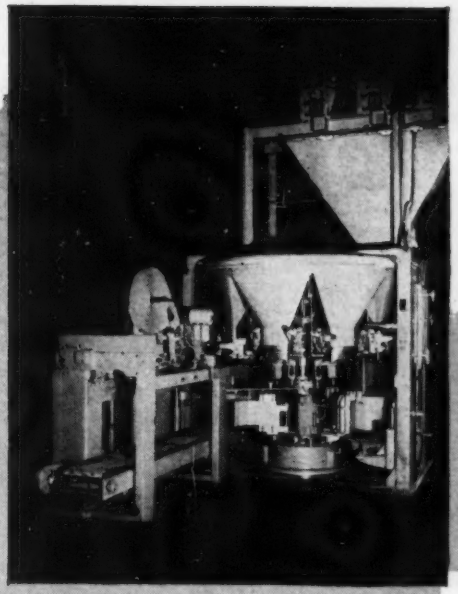
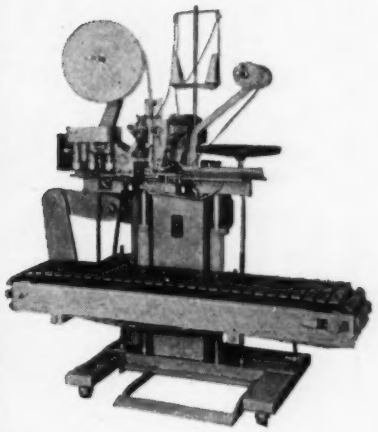


MODEL "A" —Completely automatic—extremely accurate weighing. Saves on "give away" material, labor and bag costs, thus paying for itself quickly. Machine capable of filling and closing 100-lb. bags at the rate of 15 per minute . . . needs one operator.

Bagpak

Sets the pace for Packaging!

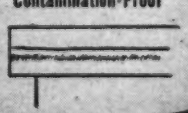


BAGPAKER® machines and methods provide low-cost packaging . . . speedy, modern packaging. The **BAGPAKER** operation gives you this unbeatable combination: tough **BAGPAK®** open-mouth multi-wall paper bags *plus* a "cushion-stitch" closure that's really contamination-proof, sift-proof and moisture-resistant.

A **BAGPAK** engineer will gladly show you how a **BAGPAKER** paves the way to lower packaging costs . . . better weighing, closing and handling. Write us; he'll call at your plant.

ALL BAGPAKERS MAKE THIS FAMOUS "CUSHION STITCH"

Taped closure is Moisture-Resistant — Sift-Proof — Contamination-Proof



MODEL "DA" (Portable and built to last)—One operator, filling and closing, can handle 2 to 4 100-lb. bags a minute . . . 6 to 12 a minute where filled bags are delivered to **BAGPAKER** conveyor (quickly adjustable for various bag sizes). Starting and stopping of sewing operation is automatic . . . no tape wasted.

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INTERNATIONAL PAPER COMPANY
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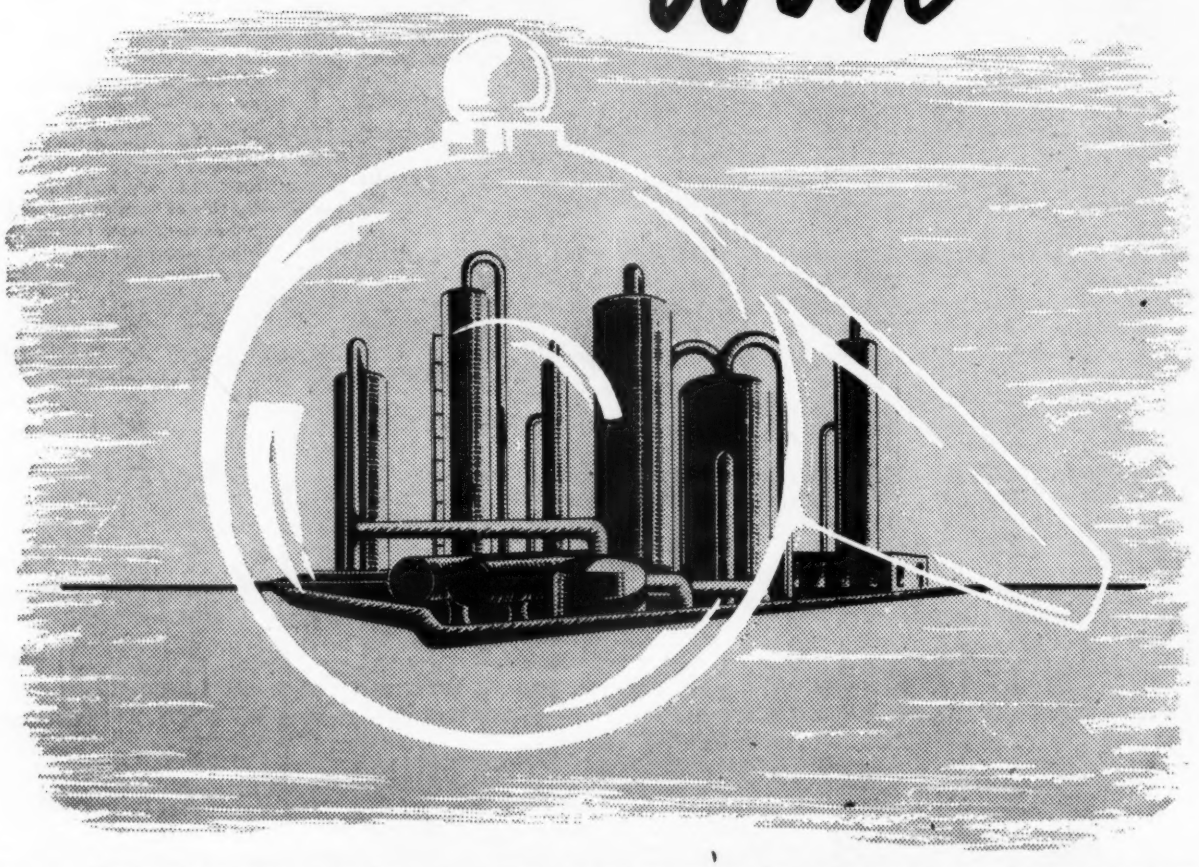
In Canada: Continental Paper Products, Ltd., Montreal, Ottawa

ISCO CHEMICALS AT *Work*



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Some of these commodities are available for prompt shipment; others only for future shipment. Let us know your requirements.

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Carbonate of Potash	Naphthalene
Bleaching Powder	Sodium Silicofluoride
Formic Acid	Carbon Tetrachloride
Irish Moss	Potassium Chlorate
Para Dichlorobenzene	Sodium Formate

Manufacturers of creams requiring water-in-oil type bases should investigate our ISCO ABSORPTION BASES. A product of the Isco laboratories, these unusual bases are made entirely of chemically pure substances and are absolutely neutral. Among the outstanding features of Isco Absorption Bases are their ability to absorb up to five times their own weight of water and hold it in an emulsion. Powder base creams, all purpose creams, night creams, hair conditioning creams—all can be made easily and economically with Isco Absorption Bases.

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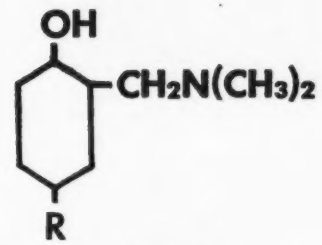
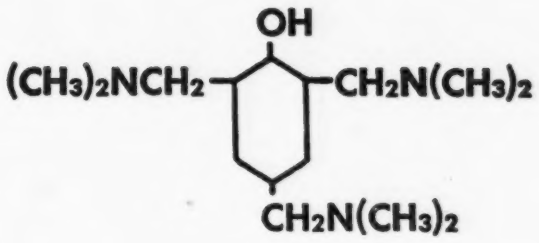
Consider Rohm & Haas DIMETHYLAMINOMETHYL PHENOLS



DMP-10 (R = H)
DMP-14 (R = t-C_4H_9)
DMP-18 (R = t-C_8H_{17})

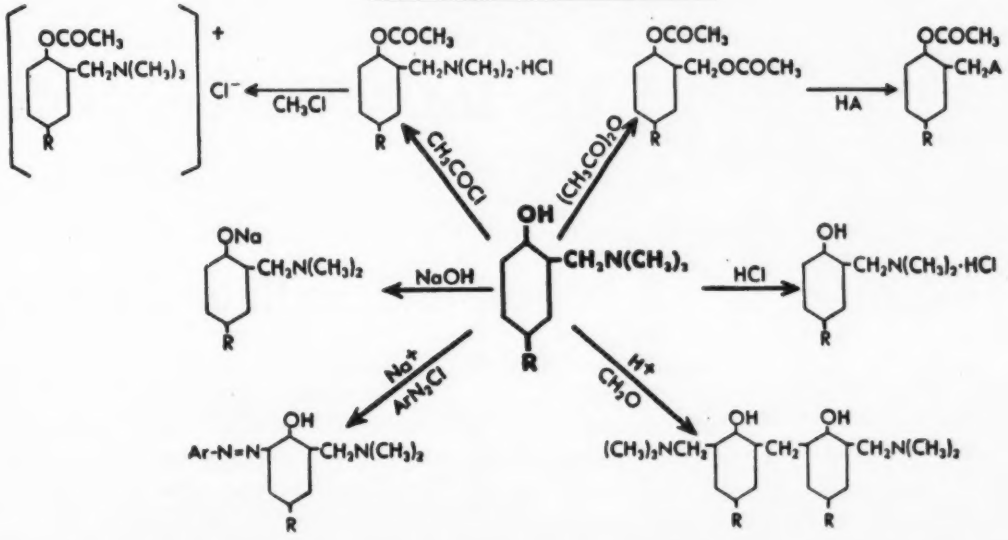
Availability: **Semi-works**



DMP-30

Availability: **Laboratory quantities**

Typical Reactions



Literature describing these reactions and others, and samples for your investigation, may be obtained by writing to Dept. SP.

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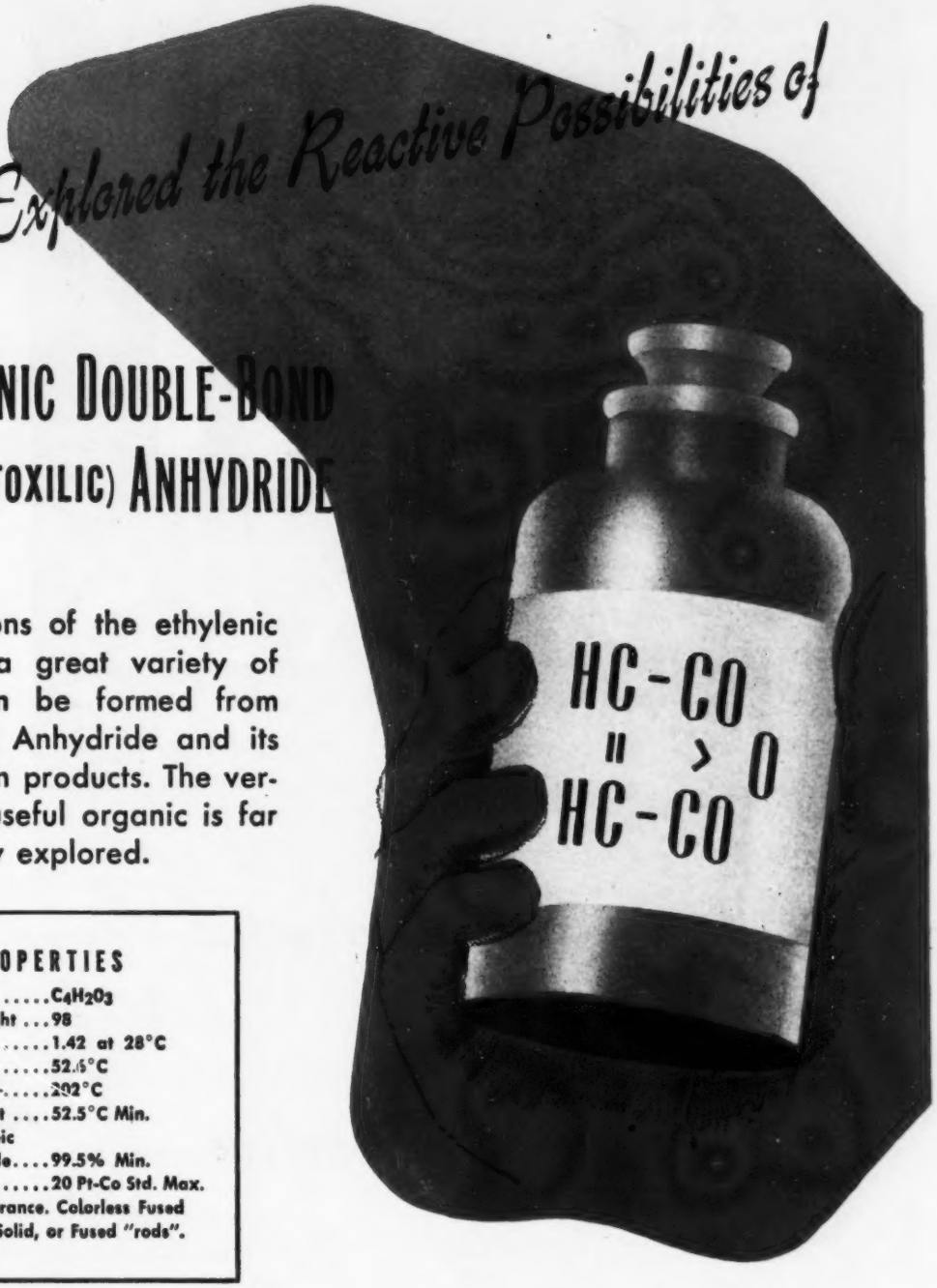
THE ETHYLENIC DOUBLE-BOND *in* MALEIC (TOXILIC) ANHYDRIDE

Through reactions of the ethylenic double-bond, a great variety of compounds can be formed from Maleic (Toxilic) Anhydride and its primary reaction products. The versatility of this useful organic is far from being fully explored.



PROPERTIES

Formula	$C_4H_2O_3$
Molecular Weight	98
Density	1.42 at 28°C
Melting Point	52.6°C
Boiling Point	202°C
Solidifying Point	52.5°C Min.
Acidity as Maleic Acid Anhydride	99.5% Min.
Color Molten	20 Pt-Co Std. Max.
Physical Appearance	Colorless Fused Crystalline Solid, or Fused "rods".

OTHER NATIONAL ANILINE CHEMICALS INCLUDE:

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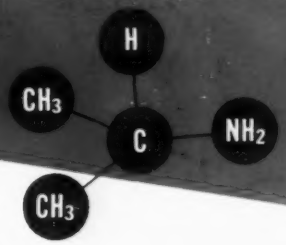
SHARPLES ISOPROPYLAMINE



- Can be supplied in anhydrous form without use of pressure containers.
- Undergoes all reactions typical of primary aliphatic amines.
- Suggested applications: as intermediate for

PHARMACEUTICALS RUBBER CHEMICALS DYESTUFFS
INSECTICIDES TEXTILE ASSISTANTS

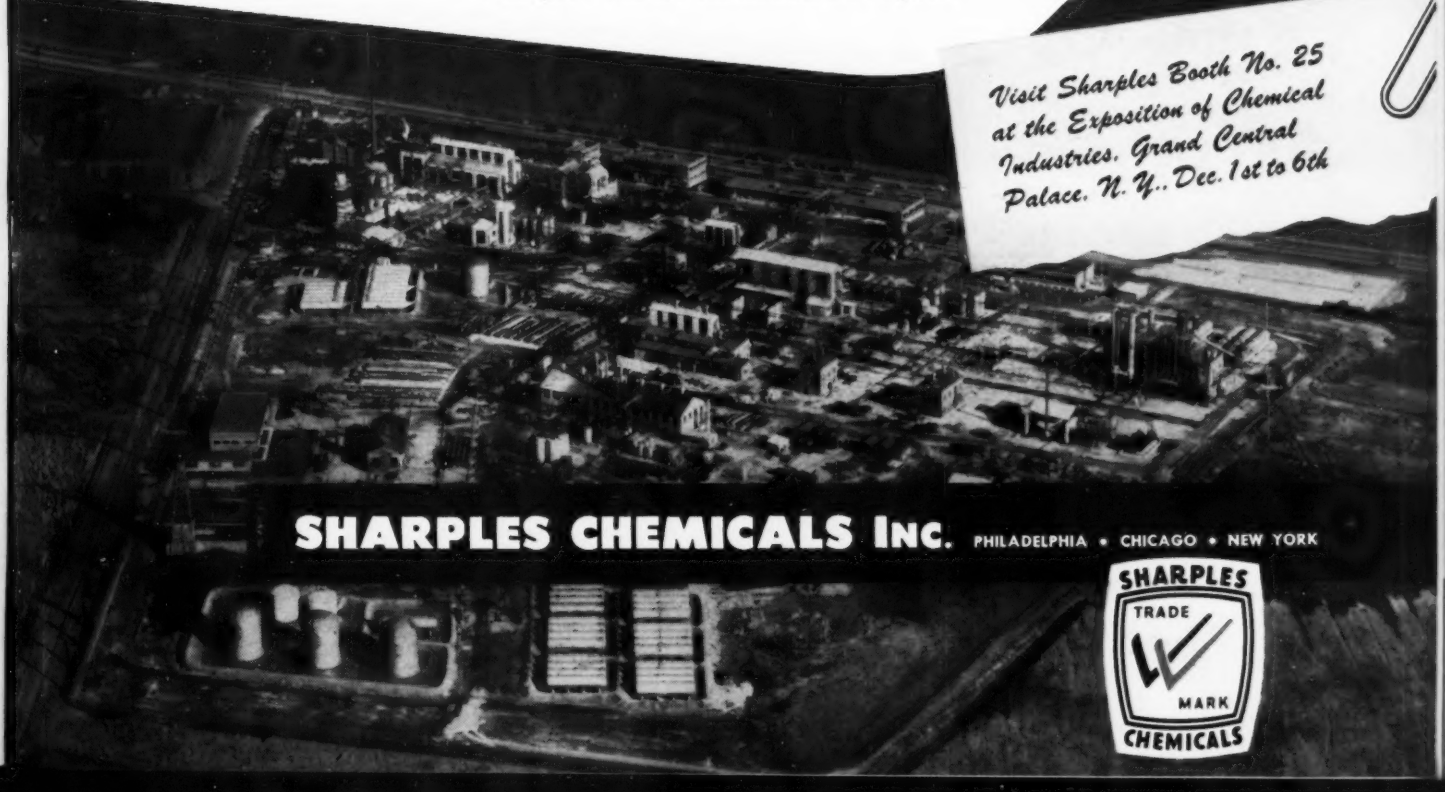
PROPERTIES

Color	Water White
Specific Gravity at 20°/20°C.	0.68-0.69
Titre as Isopropylamine	Min. 98.0%
Acid insolubles	Max. 0.2%
Distillation: 95% distills between	30.5-34.5°C.
Molecular weight (calc'd)	59.1
Flash Point (open cup)	< 20°F.
Viscosity at 25°C.	0.36 Centipoise
Refractive Index at 20°C.	1.376
pH Value (0.5 N Solution)	12.2
pH Value (0.05 N Solution)	11.6
*Freezing Point	-101.2°C.
Soluble in water and most organic solvents	

*Literature Value

Samples will be furnished on request

Visit Sharples Booth No. 25 at the Exposition of Chemical Industries, Grand Central Palace, N. Y., Dec. 1st to 6th



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AMYLAMINE ETHYLAMINE BUTYLAMINE
DIAMYLAMINE DIETHYLAMINE DIBUTYLAMINE
TRIAMYLAMINE TRIETHYLAMINE TRIBUTYLAMINE
DIETHYLAMINOETHANOL
ETHYLETHANOLAMINES 161
DI-sec-AMYLPHENOL

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TETRAETHYLTHIURAM MONOSULFIDE
TETRAMETHYLTHIURAM DISULFIDE
ZINC DIETHYLDITHIOCARBAMATE
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ZINC DIBUTYLDITHIOCARBAMATE
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A BURNT FINGER

and a Party Dress

— And the hostess—unknowingly—thanked Kelco Algins when the burn ointment eased the finger's pain and the brilliance of the gayly-patterned dress soothed her mind!

In suiting such widely diversified applications as emulsifier for ointments and thickener for textile printing pastes, you find an example of the amazing versatility of Kelco Algins. They are equally effective as stabilizer for ice cream, hydrophilic colloid for cold water paints, suspending agent for chocolate milk, sizing agent for paperboard high gloss ink preparation, and countless other commercial processes calling for a film, thickening, suspending or gel-forming agent.

Kelco Agins are non-variable and readily adjust themselves to critical changes of environment. They assure perfect balance, uniformity and stability.

Rigidly-processed products of nature that insure consistently uniform results, Kelco Algins are free of impurities and easy to handle. Additionally, they are extremely economical in all applications. Full information in regard to their adaptation to your needs will be forwarded upon request.

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Life....on the

Photographs courtesy Union Bag & Paper Corp.

LEATHER GOODS of many types attain new heights of attractiveness and serviceability when made of hides treated with Cyanamid leather processing chemicals. Outstanding among these is Cyanamid's new TANAK* MRX Synthetic Tanning Material for tanning leathers which are white throughout, making the leather extremely full and mellow. The new material is used also for bleaching chrome leather for whites, and for combination tannages. Full information on this and other Cyanamid leather processing chemicals is available.

NOW IT'S ICE IN PAPER BAGS FOR HOME AND COMMERCIAL USE

DURABLE SANITARY "ONE-TRIP" PAPER BAGS for economical packaging and delivery are an important new application for paper given extraordinary wet and dry strength with Cyanamid's PAREZ† Resin 607. The new bags offer many advantages to processed-ice users ranging from housewives and home "party-throwers" to hotels, restaurants, clubs, railroad dining cars and food stores.

Thanks to the new bags, processed ice becomes easy to purchase and handle. Spillage and leakage are eliminated. Tightly closed at the mouth, the bags keep the ice clean and sanitary. The insulating qualities of the paper make the ice "keep" longer. And there are no containers to be kept track of and returned. Small wonder the new bags are a nationwide "hit" with the public, with ice companies.

How does PAREZ Resin 607 enable paper to stand up to such an unusual job? The answer is simple. Added to the paper stock during the manufacturing process, this remarkable resin binds the fibers together with a bond insoluble in water and most other liquids. Thus imparted are exceptional wet and dry strength, improved tensile and bursting strength, and added folding resistance. Dry or soaking wet, such papers remain strong and difficult to tear.

Typical and ever-widening uses of papers given these qualities with PAREZ Resin 607 range from disposable laundry tags and tear-resistant photographic papers to rugged shipping crate liners . . . from unusually durable bag, sack, twisting and wrapping papers to such decorative and utilitarian household items as draperies, tablecloths and napkins, towels, wall papers and dusting "cloths." Cyanamid's paper chemical technicians will gladly advise as to use of this remarkable resin.

†Trade-mark of American Cyanamid Company covering its synthetic resins for use by the paper industry. The processes under which PAREZ is applied in the production of wet strength paper are covered by U. S. Patents Nos. 2,291,079, 2,291,080 and 2,345,543 and U. S. Patent Application Serial No. 453,032.

Chemical Newsfront

PRESCRIPTION FOR MUD. The average motorist may not know it, but mud is one of the chief "tools" used in drilling for the petroleum that supplies his car with oil and gasoline. In this unusual photograph we see drilling mud bubbling up around the drill pipe at the mouth of a new well. The mud's job is to cool the drilling bit . . . bring cuttings to the surface . . . prevent cave-ins and blow-outs. To do all this efficiently at depths of a mile or two underground, drilling mud must be constantly regulated as to consistency and chemical make-up. This calls for special drilling mud chemicals, of which Cyanamid makes a complete range.

When harmful calcium and magnesium compounds are encountered underground, for instance, QUADRAFOS* (Sodium Tetraphosphate) Compound, sold by Cyanamid, is added to the drilling mud to make them inactive, and thus permit drilling to proceed at top speed. AEROFLO* Mud Conditioning Compound solves viscosity problems in deep wells and at high temperatures. And AEROTAN** Water-Loss Control Reagent controls water loss under the most extreme conditions, and is definitely superior for treatment of cement-contaminated muds. Capable field engineers are ready at all times to demonstrate how these chemicals can help cut costs and increase production.

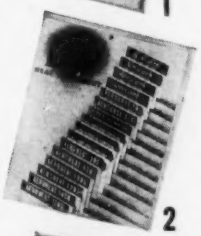
FIVE IMPORTANT NEW CYANAMID PUBLICATIONS

One or more of these booklets may help you increase your production, reduce operational costs. Check the booklets that you want, and write Cyanamid. Your copies will be sent promptly and without charge.

1

☐ **1**

FILT-R-STIL* Demineralizing Units deliver mineral-free water at an amazingly low fraction of the cost of distilled water. This new booklet details the operation and uses of these economy-producing units.


2

☐ **2**

Here's an unusually full discussion of the advantages of modern salt baths for heat treating, case hardening and carburizing. Also described are Cyanamid's complete line of salts for these purposes.

3

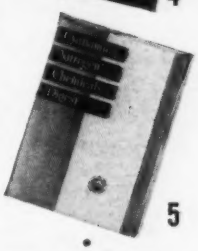
☐ **3**

Cyanamid here presents its new AEROCAT** MS-A Synthetic Fluid Cracking Catalyst for the refining industry. Microspheroidal in form, the new catalyst offers increased catalytic efficiency with minimum formation of fines.

4

☐ **4**

Complete technical information on Cyanamid's AEROLUBE* Additives for high-quality motor oils. AEROLUBE Additives provide maximum corrosion resistance, oxidation stability, and engine cleanliness.


5

☐ **5**

Described here are some of the new nitrogen derivatives developed by Cyanamid. All are offered for research in the field of chemical synthesis and for the development of new products.

*Reg. U. S. Pat. Off. **Trade-mark

AMERICAN Cyanamid COMPANY

Industrial Chemicals Division

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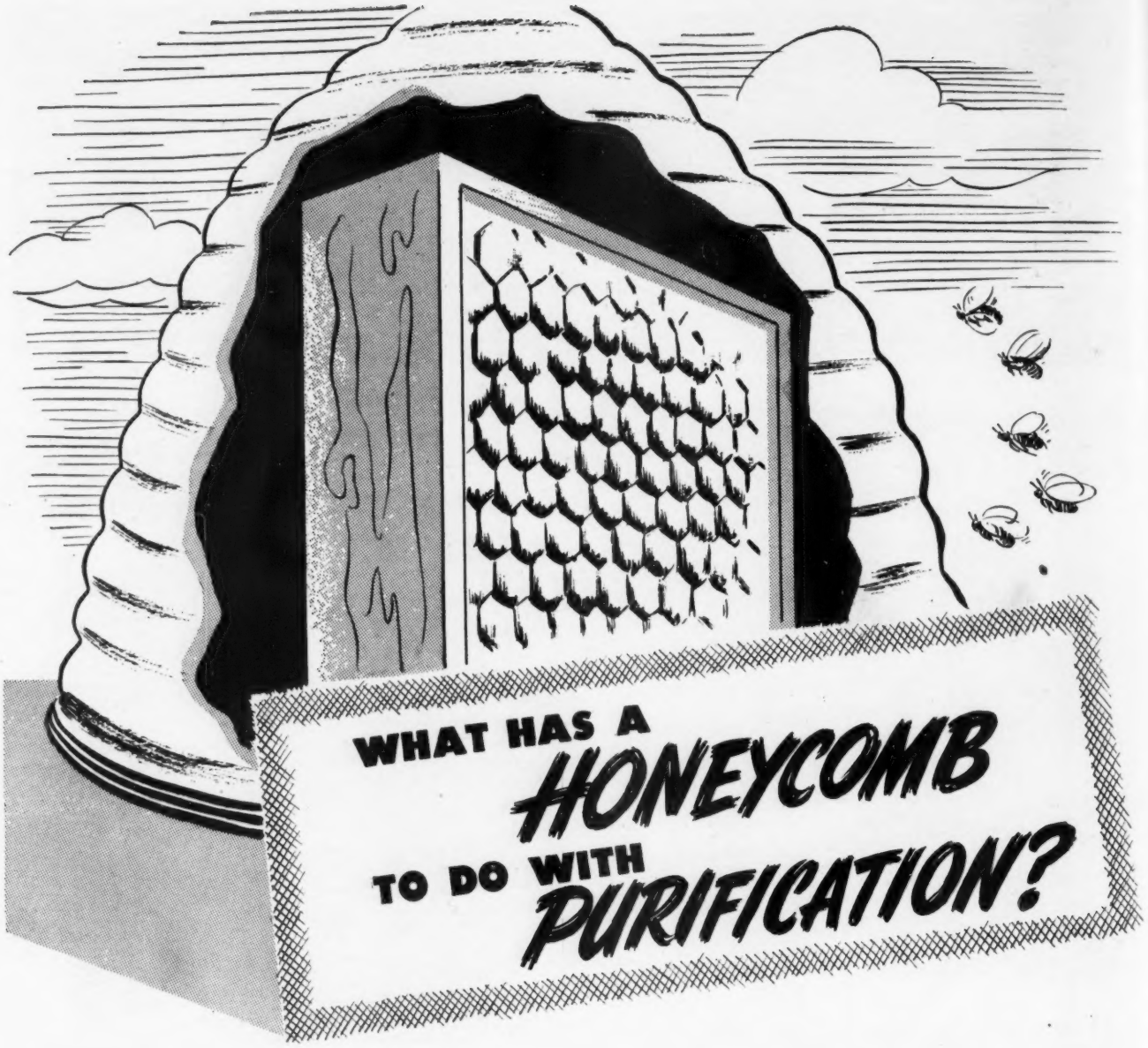

Just this . . . there are about 120 billion particles in one gram of Nuchar Activated Carbon and every particle is a veritable honeycomb bristling with active surfaces. Nuchar's amazing power to adsorb impurities is due chiefly to this tremendous surface area together with its inherent structural make-up and lattice-work pattern of "active patches."

Where undesirable colors, odors or tastes are present you should investigate purification by adsorption, a process in which little or no additional equipment is necessary. The effectiveness and economy of using Nuchar Activated Carbon have definitely established it as a recognized and dependable tool in the purification field.

Our technical staff will gladly cooperate with you on any or all of your problems concerning activated carbon. Our technicians possess the "know-how" and can "show-how" to obtain optimum results with Nuchar Activated Carbon in your process.

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Thousands who are hard-of-hearing now enjoy new comfort and relief.

A new development makes hearing aid instruments lighter, more compact, and more effective. This is the Mallory Dry Battery, a tiny but incredibly powerful and long-lasting battery.

Less than one-third the size of the conventional dry cell but with a capacity just as great, the Mallory Dry Battery is one of the smallest "A" batteries produced.

Developed during the war for use in walkie-talkies and mine detectors, the Mallory Dry Battery is used today chiefly in hearing aids. But it has a practically unlimited future in midget size radios, home fire alarm systems, handie-talkie sets, and other electronic devices.

One of the factors essential to the success of this new type battery is the use of chemicals to exacting specifications. The J. T. Baker Chemical Co. is supplying such a chemical for this battery.

Chemical exactness is an art long associated with the name of J. T. Baker Chemical Co. A pioneer in reagent laboratory chemicals with the *actual analysis on the label,* Baker has been trained to produce purity to the decimal for industry to the most exacting specifications.

If you have special chemical requirements—if you require chemical measured purity to predetermined standards, we invite you to discuss your problems with us in confidence.

We may be able to help you. Baker Chemicals keep abreast of industry's exacting needs.

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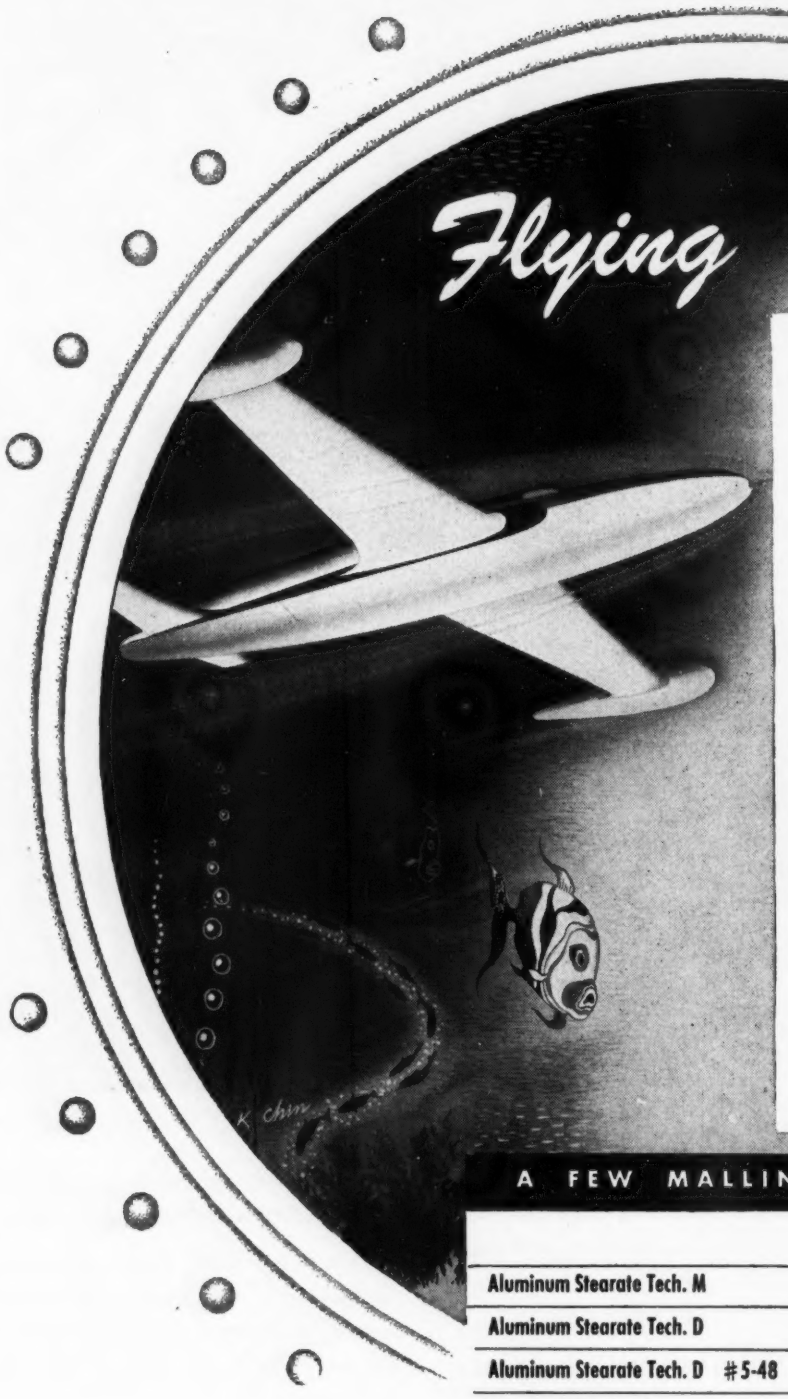

Flying UNDER WATER

Aircraft engineers have actually towed full scale airplanes under water—several fathoms down—in their search for better design and construction. Low speed in water was used to simulate high speed in air. Records automatically made of stresses and strains during the tests located weaknesses in the plane. Genius of the aircraft industry in developing punishing and revealing tests and in building its product to meet them are the foundation of its success.

Less spectacular but equally searching are the many tests which **Mallinckrodt stearates** meet. Superior, too, are the products developed by this constant searching for weakness, this constant striving toward perfection.

Valuable in a variety of applications—gelling, coating, lubricating, releasing and repelling moisture—**Mallinckrodt stearates** are made to exacting specifications. Uniform dependable purity characterizes each type and grade.

A FEW MALLINCKRODT STEARATES

	BULK	METALLIC OXIDE	ACETONE EXTRACTABLE	MELTING POINT
Aluminum Stearate Tech. M	50-55 ft. oz./lb.	14-15%	6.6-7.5%	190-200° C
Aluminum Stearate Tech. D	50-55	8.4-8.7	6-7	155-160
Aluminum Stearate Tech. D #5-48	45-50	8.7-8.9	6-7	155-160
Flatting Agent No. 22	60-65	8.4-8.7	9-10	145-150
Aluminum Stearate Fluffy	60-65	8.4-8.7	6-7	145-150
Aluminum Stearate Tech. TD	85-95	7.5-8.0	12.5-13.5	125-130
Aluminum Stearate Tech. T	60-65	6.0-6.5	24-25	105-110
Ammonium Stearate Tech.	30-35	———	decomposes	decomposes
Calcium Stearate Impalpable Powd. Gr. A	130-150	8.8-9.3	0.5-1.0	145-150
Calcium Stearate Tech. Bulky Gr. A	130-150	8.8-9.3	0.5-2.5	145-150
Magnesium Stearate Impalp. Powd. Gr. A	115-130	7.5-8.0	0.5-1.0	125-130
Sodium Stearate Tech. Grade A	35-40	9.5-10.5	———	175-180
Zinc Stearate Tech.	130-150	13-14	1-2	112-117
Zinc Stearate U.S.P. XIII Grade A	130-150	13-14	1-2	112-117

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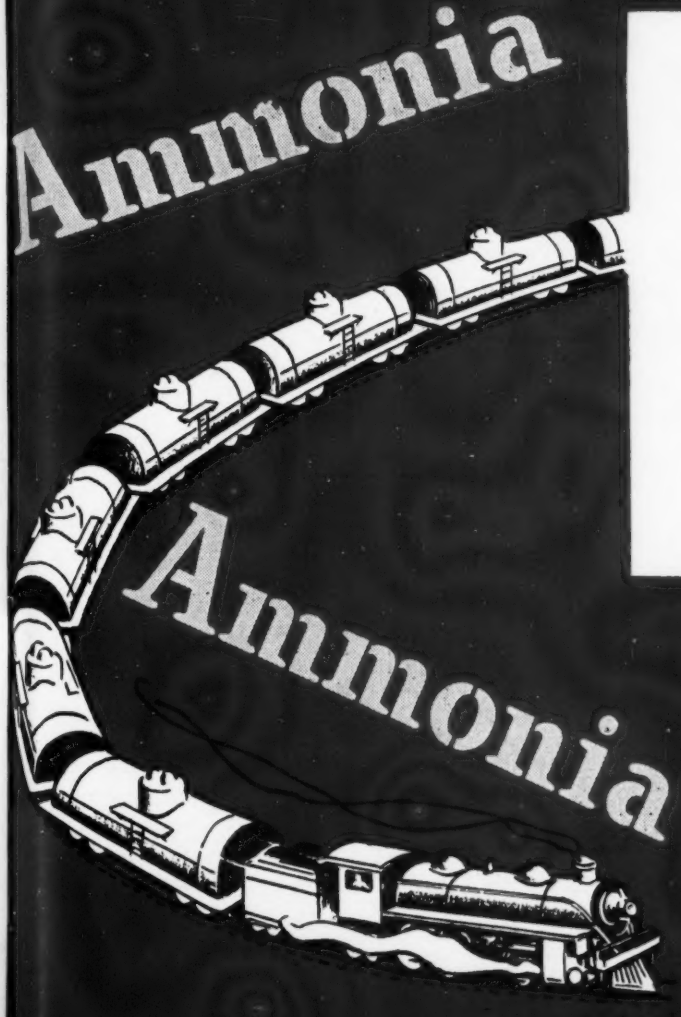

DAYS CLOSER TO YOU...

ANHYDROUS AMMONIA:
Commercial grade: 99.5% NH_3; maximum moisture content, .05%. Typical Analysis: 99.95% NH_3; .03% moisture; 2-3 ppm oil.

AQUA AMMONIA:
26° Baume grade, 29.4% NH_3 content. Color: water white. No H_2S or pyridine content.

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The combination of Standard Silicates and Standard Technical Service eases your production problems. Having a complete line of Standard Silicates to choose from, you can pick the grade that best suits your needs. Standard Technical Service helps you make the choice, and helps you use these high quality dependable products most effectively. Use Standard's Teamwork to improve your production!

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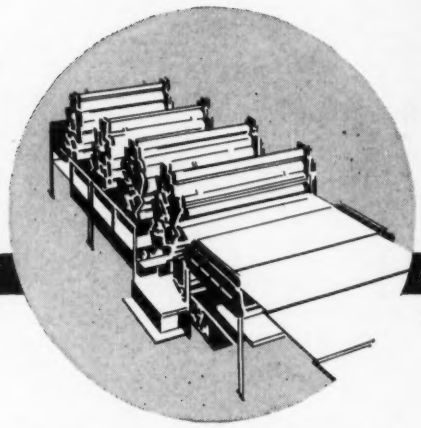

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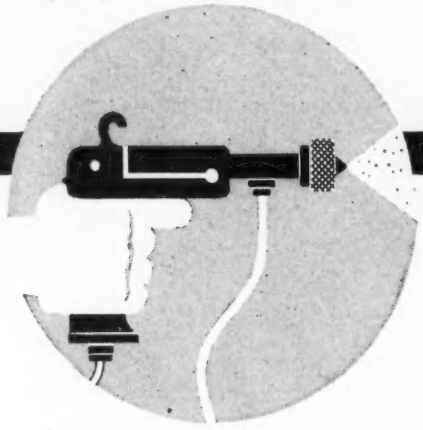

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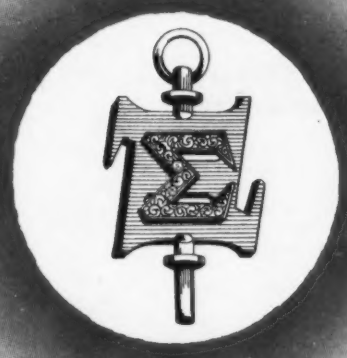

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This is the sixty-first birthday of The Society of the Sigma Xi, Scientific Research Society of America. Down through the decades. its Greek letter-key has become symbolic of the highest ideals of the scientific world.

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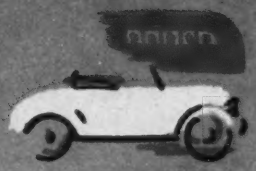
Branches in All Principal Cities

EXPLOSIVES
Soda Ash

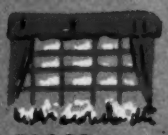


PETROLEUM
Soda Ash
Caustic Soda
Silicate of Soda

RUBBER
Caustic Soda
Calcium Carbonate

ALUMINUM
Soda Ash
Caustic Soda

PULP and PAPER
Soda Ash
Caustic Soda
Chlorine
Calcium Carbonate
Chlorowax



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Soda Ash
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Silicate of Soda

In the processing of America's most essential products

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Chlorine
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Caustic Soda
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FOOD PRODUCTS
Caustic Soda
Silicate of Soda
Bicarbonate of Soda
Soda Ash

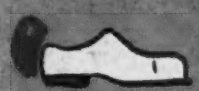
CHEMICALS
Soda Ash
Caustic Soda
Bicarbonate of Soda
Silicate of Soda
Chlorine
Sodium Bichromate

TEXTILES
Soda Ash
Caustic Soda
Bicarbonate of Soda
Silicate of Soda
Chlorine
Chlorowax

MEDICINAL
Chlorine
Bicarbonate of Soda
Calcium Carbonate
Soda Ash

CLEANERS
Soda Ash
Caustic Soda
Sodium Silicates
Bicarbonate of Soda
Modified Soda
Carbon Tetrachloride

PAINT
Sodium Bichromate
Calcium Carbonate
Chlorowax



LEATHER
Bicarbonate of Soda
Sodium Bichromate
Soda Ash

DIAMOND ALKALI COMPANY

PITTSBURGH, PA. and Everywhere

One of a series *of messages to help you increase your understanaing of business paper advertising, and its effect on your business.*

Why you and your advertising manager are partners

FROM WHERE YOU SIT, advertising may look like the "glamour department" of your company—necessary, of course, but pretty far removed from the hard-headed realities of the production line.

But take a closer look. In one respect, the advertising manager's job bears a striking resemblance to your own.

You're production-minded. You're concerned with anything that will improve plant procedures, speed up assembly time, prevent waste, and reduce the manufacturing cost per unit.

And that is precisely where you walk arm-in-arm with your advertising manager. Because he thinks the same way about the *manufacture of a sale.*

The whole process of selling and distribution are his assembly line. And every time he can reduce the unit cost of a sale by so much as a few cents, he increases your company's chance to show a profit.

Ask him for a definition of advertising, and he will probably tell you that it is simply *mechanized selling,* a machine that multiplies the productive capacity of the sales force — seeking out prospects, arousing their interest, creating a preference for the things your company makes.

And when it is concentrated among the hand-picked readers of business papers, advertising becomes the most efficient machine this partner of yours has found for lowering the cost of producing a sale.

What are the ten ways to measure the results of your business paper advertising? You'll find the answers in a recent ABP folder, which we'll be glad to send you on request. Also, if you'd like reprints of this advertisement (or the entire series) to show to others in your organization, you may have them for the asking.

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is one of the 129 members of The Associated Business Papers, whose chief purpose is to maintain the highest standards of editorial helpfulness—for the benefit of reader and advertiser alike.

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A-26

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"VELSICOL 1068"
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is the modern solution to the age-old problem of obtaining effective control of the destructive and obnoxious insects that infest our homes, institutions, and fields. Readily formulated it is outstanding for the control of

HOUSEHOLD PESTS *Ants, Bedbugs, Carpet Beetles, Flies, Mosquitoes, Moths and Silverfish.*

AGRICULTURAL PESTS *Armyworms, Chinch Bugs, Grasshoppers, Cotton Boll Weevil, Lygus Bugs, Squash Bugs.*

VELSICOL *Insecticidal* PRODUCTS

VELSICOL INSECT TOXICANT *solvents*

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AR • 60 *for Agricultural Sprays and Dusts*
AR • 70 *for Aerosol Formulations*
NR • 70 *for Mosquito Abatement*

The VELSICOLS, excellent solvents for DDT, Rotenone, Pyrethrum, and Pentachlorophenol, assure the formulation of dependable products displaying maximum efficiency.

For complete technical data consult Velsicol's Technical Service Department.

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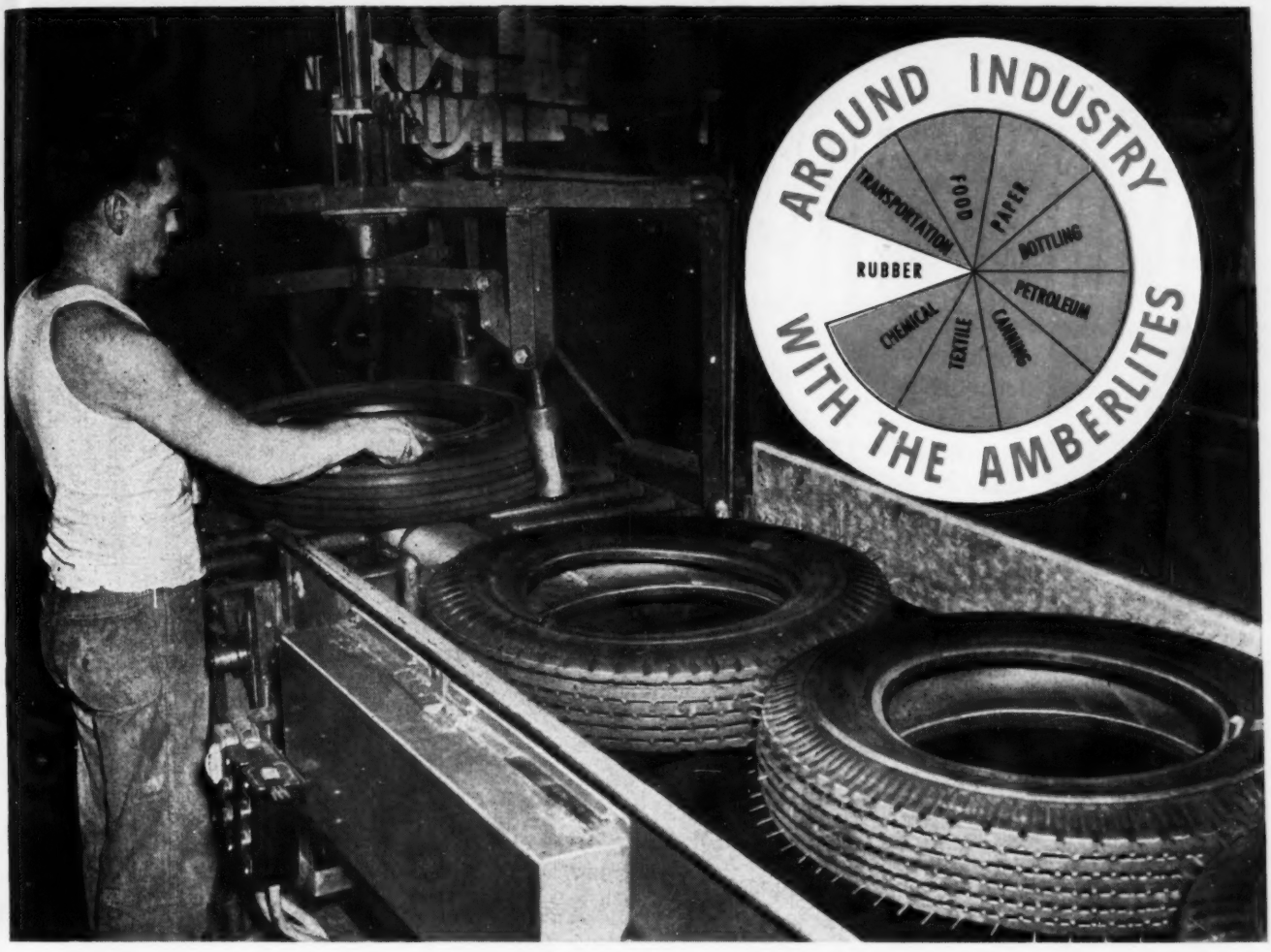
G. E. Missbach, Atlanta 3 • Midwest Products Co., St. Paul 4 • Mount-Alsop, Portland, Ore • Also in Canada



Amberlite Ion Exchange Resins control quality of synthetic rubber

In the synthetic rubber industry, salts and trace materials in water supplies retard the polymerization of GR-S, make latices unstable, and deposit scale on cooling tower lines and boilers. Huge volumes of deionized water, comparable to single distilled in quality, are obtained *at low cost* by passage of raw water supplies through AMBERLITE cation and anion exchange resins operating in series. Scale-free operation of boilers and cooling lines is assured by softening water with AMBERLITE IR-100, cation exchanger.

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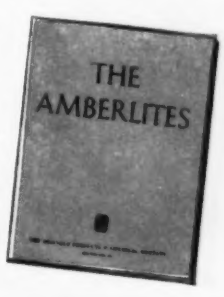
Our booklet "THE AMBERLITES" *suggests many applications for these time-tested Ion Exchange Resins—some applications already commercially established, others pointing the way to new fields of investigations. For your copy of this booklet, address The Resinous Products & Chemical Company, Dept. CE-10, Washington Square, Phila. 5, Pa.*



AMBERLITE *is a trade-mark, Reg. U. S. Pat. Off.*

THE RESINOUS PRODUCTS & CHEMICAL COMPANY

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More than twenty years ago Powell foresaw the vast growth and diversification that was to come in the chemical and process industries. Acting on this foresight, Powell established its Special Design and Alloy Valve Division and started to build a complete line of valves to handle every known kind of corrosive media. And for many years thereafter, Powell was the *only* manufacturer of corrosion-resistant valves.

Now the Powell Line of Corrison-Resistant Valves, including many special designs, is available in the widest range of pure metals and alloys ever used in making valves. This line, together with Bronze, Iron, and Cast Steel Valves of every required type, design, size and pressure, makes Powell today *the ONLY manufacturer offering a COMPLETE line of valves for the Chemical and Process Industries.*

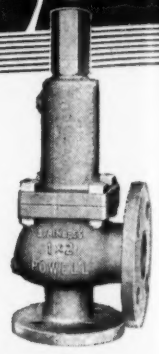

Fig. 2327 — Stainless Steel Angle Relief Valve with enclosed spring.

The Wm. Powell Co., Cincinnati 22, Ohio

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21st Exposition of Chemical Industries
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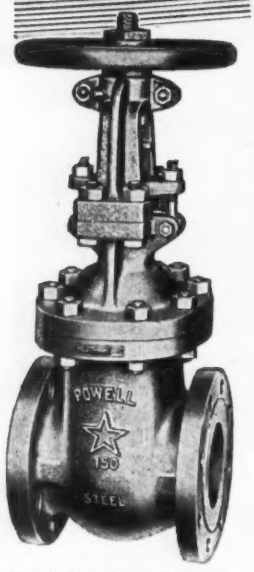

Fig. 1503—Class 150-pound Cast Steel O. S. & Y. Gate Valve with flanged ends.

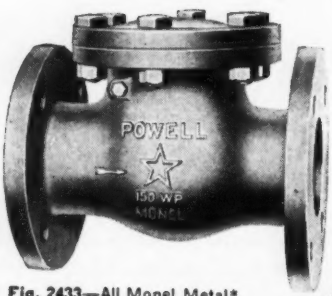

Fig. 2433—All Monel Metal* Swing Check Valve for 150 pounds W. P.

Fig. 2051 S. W.—Stainless Steel 150-pound O. S. & Y. "Y" Valve with Powell Patented Seat Wiper. ◀

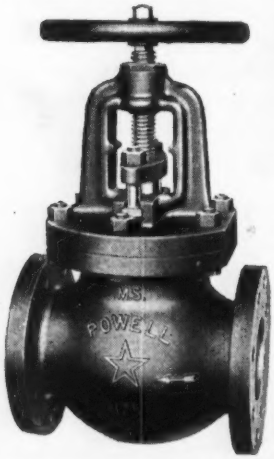

Fig. 241—125-pound Iron Body Bronze Mounted O. S. & Y. Globe Valve. Also available in All Iron.

Fig. 1944—Large Size 150-pound Inconel* O. S. & Y. "Y" Valve. Made in sizes 2½" to 12", incl.

Fig. 1095—Hastelloy† Separable Body, Reversible Seat "Y" Valve for 300 pounds W. P. ▼

POWELL

and Process Industries will solve flow control requirements.

Fig. 2097—Stainless Steel Glass Sight Feed or Look Box. Pipe sizes, ½" to 6".

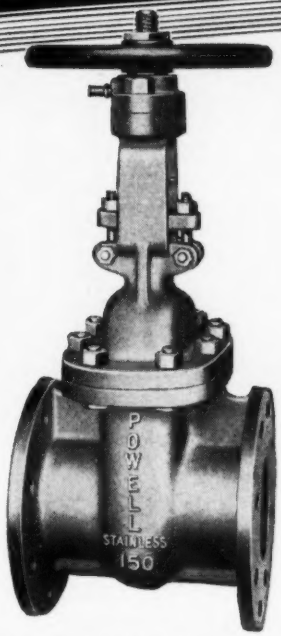

Fig. 2453-G—New, standard 150-pound Stainless Steel Gate Valve with outside screw rising stem, bolted flanged yoke-bonnet and taper wedge solid disc.

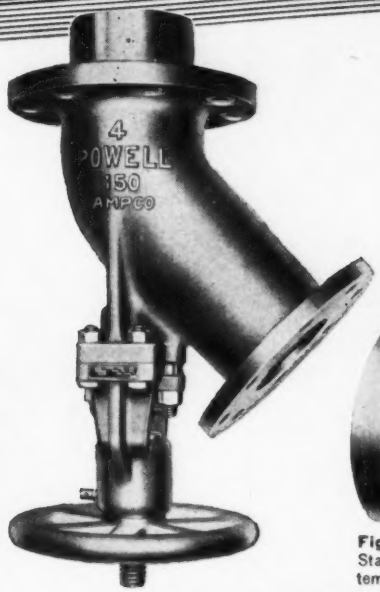

Fig. 2309 — 150-pound Ampco Flush Bottom Tank Valve for attaching to metal tanks and autoclaves.

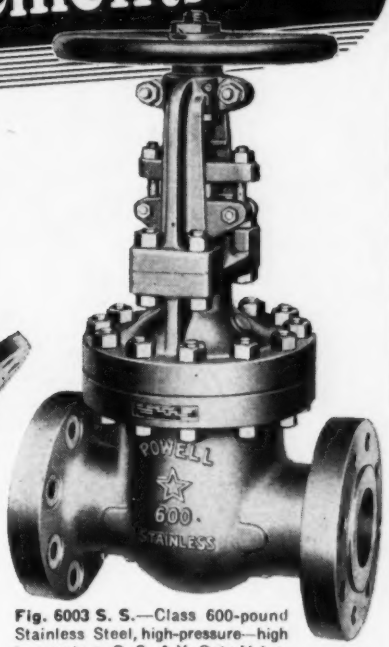

Fig. 6003 S. S.—Class 600-pound Stainless Steel, high-pressure—high temperature, O. S. & Y. Gate Valve.

Fig. 1891 Q. O. — Liquid Level Gauge. Offset pattern. Quick opening thread on stem. Cross levers for chain operation. For 150 pounds W. W. P.

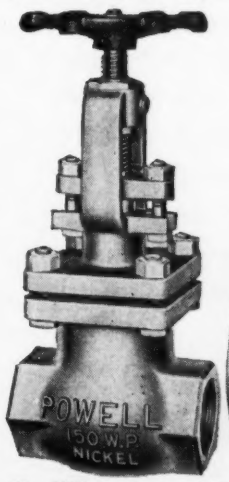

Fig. 1968 — 150-pound Nickel Gate Valve with screwed ends, outside screw rising stem, bolted flanged yoke-bonnet and taper wedge solid disc.

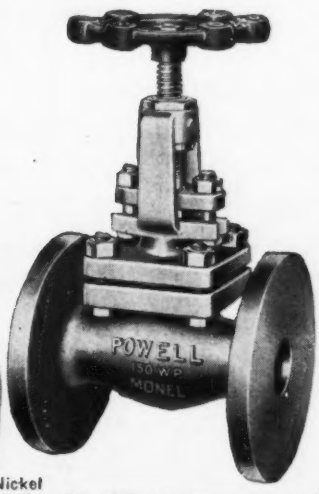

Fig. 1979—150-pound Monel Metal* Globe Valve. Flanged ends, bolted flanged yoke-bonnet and outside screw stem.

Fig. 375—200-pound Bronze Gate Valve with union bonnet, inside screw rising stem and renewable, wear resisting "Powellium" nickel-bronze disc.

Fig. 1845—200-pound Nickel Swing Check Valve. Screwed-in cap and regrindable, renewable disc. ◆

POWELL VALVES for Corrosion Resistance are available in the following Metals and Alloys.

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18-8S Cb.
Misco "C"
Durimet 20
11.5-13.5% Cr. Iron
18% Cr. Iron
28% Cr. Iron
25% Cr. 12% Ni.

Nickel and Nickel Alloys
Nickel
Monel Metal*
Inconel*
Hastelloy Alloys† (A, B, C and D)
Illium
D-10

Bronzes—Acid, Aluminum, Silicon
Everdur
Herculoy
Ampco
Ampcoloy
76
90-10
88-10-2

Alloy Steels
Carbon Steel
4-6% Cr. .5% Mo.
3½% Nickel Steel
6-8% Cr. Mo.
8-10% Cr. Mo.

Cast Irons
Cast Iron
3% Nickel Iron
Ni-resist*

Aluminum
Alcoa No. 43
Alcoa No. B-214

Silver

Hard Lead

Molybdenum

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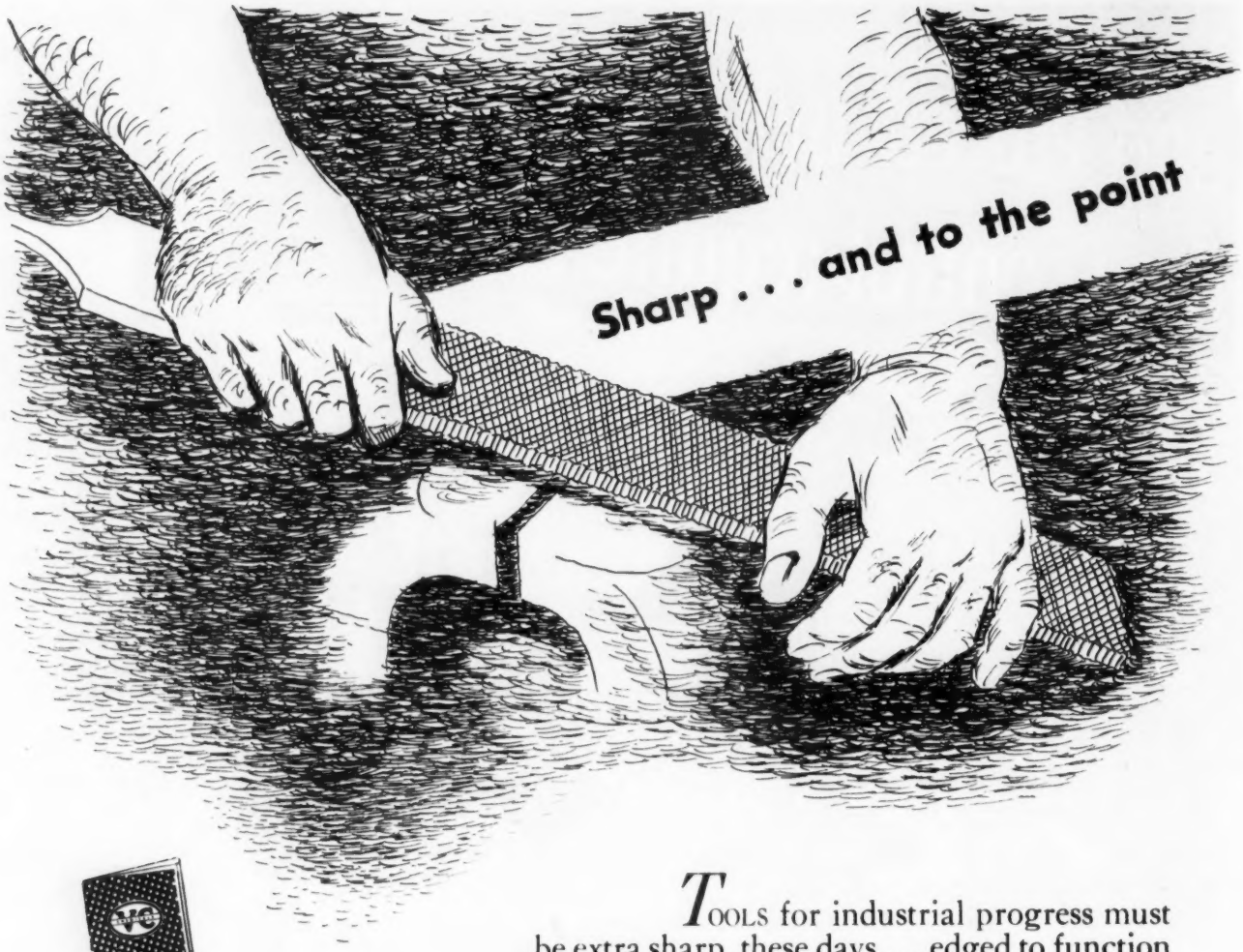
VALVES



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Perhaps your own program —your own products—can thus be pointed up for better penetration of desirable markets.

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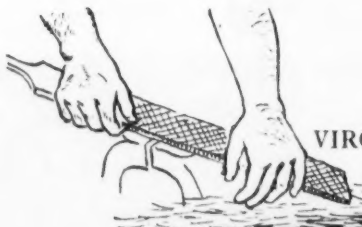

VIRGINIA-CAROLINA CHEMICAL CORPORATION
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FOR THE *Synthetic Fibre* INDUSTRIES

Here's a lusty, growing industry that has learned to count on Stauffer for "quality chemicals in quantity." They know that as they expand to meet the ever-increasing demands for rayon, acetate, nylon, etc., so will Stauffer re-double its efforts to supply increasing quantities of carbon bisulphide, caustic soda, sodium hydrosulphide, tartaric acid, sulphuric acid, nitric acid and chlorine.

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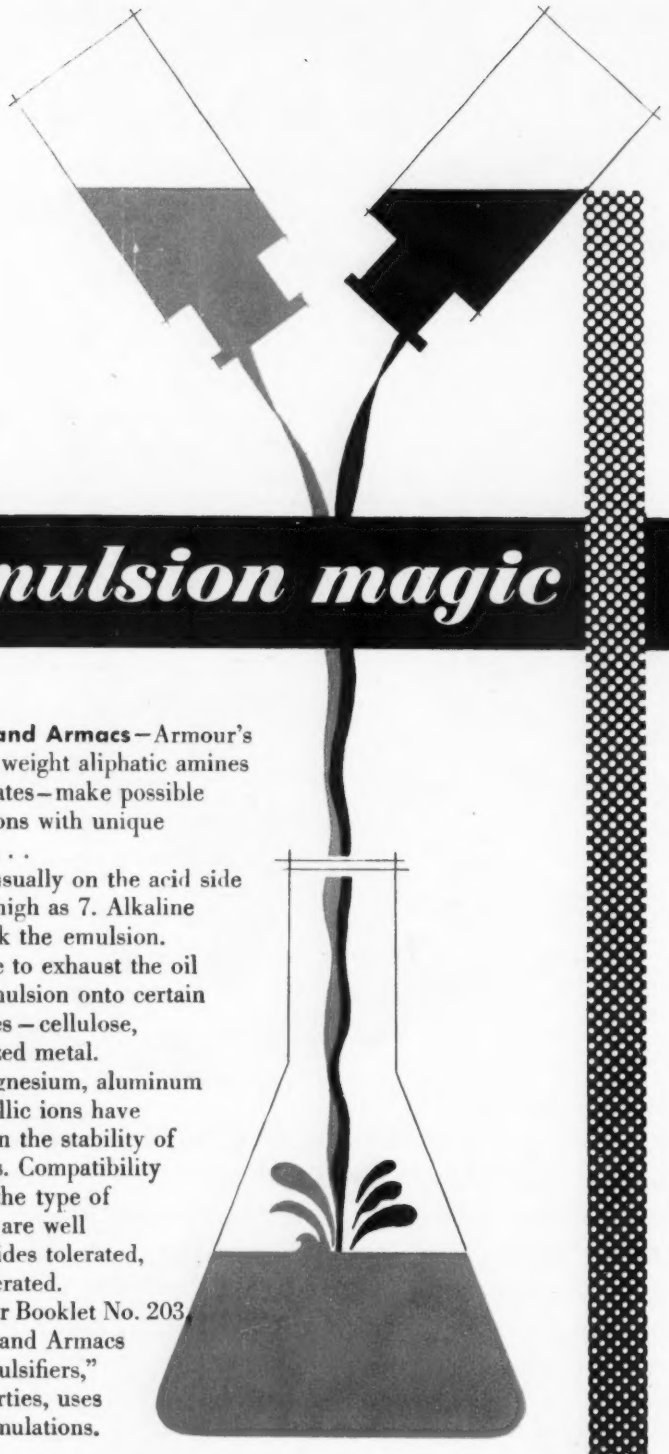
636 California St.—San Francisco 8, Cal.
424 Ohio Bldg.—Akron 8, Ohio — Apopka, Fla. — North Portland, Oregon — Houston 2, Texas

STAUFFER *Guaranteed by its name*



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The Armeens and Armacs—Armour's high molecular weight aliphatic amines and amine acetates—make possible cationic emulsions with unique characteristics . . .

Their pH is usually on the acid side but may go as high as 7. Alkaline conditions break the emulsion.

They are able to exhaust the oil phase of the emulsion onto certain types of surfaces—cellulose, siliceous, oxidized metal.

Calcium, magnesium, aluminum and other metallic ions have little effect upon the stability of these emulsions. Compatibility depends upon the type of anion—acetates are well tolerated, chlorides tolerated, sulfates not tolerated.

Write today for Booklet No. 203, "The Armeens and Armacs as Cationic Emulsifiers," covering properties, uses and typical formulations.

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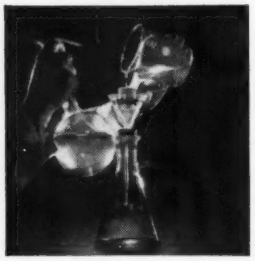

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Among the 28 new Monsanto chemicals and plastics described here, you are likely to find a number of new ideas that can be profitably applied to your business — now, or later.

For your convenience, each of these new Monsanto products is briefly described in terms of suggested uses, properties and availability... Also, each product is numbered (A-1, A-2, etc.) for easy identification and reference in asking for further information — either on the coupon on the opposite page or on your letterhead.

Your request will receive prompt attention — whether it applies to any of the products listed here, or to any other Monsanto chemicals and plastics that may help reduce your production costs, improve your product, its performance or sales.

ortho-Chlorobenzoic Acid

$Cl.C_6H_4COOH$ Mol. wt., 156.57

Suggested Uses: As an intermediate for synthesis.

Properties: Crystalline solid. Melting point, 140°C. Sublimes. Soluble in ethanol, ether and hot water.

Availability: Research quantities. (A-1)

para-Chlorobenzoic Acid

$Cl.C_6H_4COOH$ Mol. wt., 156.57

Suggested Uses: As an intermediate for synthesis.

Properties: Crystalline solid. Melting point, 235°C. Sublimes. Soluble in ethanol and ether. Sparingly soluble in water.

Availability: Research quantities. (A-2)

meta-Chloroethylbenzene

$Cl.C_6H_4C_2H_5$ Mol. wt., 140.61

Suggested Uses: As an intermediate for synthesis.

Properties: Colorless liquid. Boiling point 181–186°C. Refractive index, n25/D 1.5170. Soluble in the usual organic solvents. Insoluble in water.

Availability: Research quantities. (A-3)

ortho-Chloroethylbenzene

$Cl.C_6H_4C_2H_5$ Mol. wt., 140.61

Suggested Uses: As an intermediate for synthesis.

Properties: Colorless liquid. Boiling point, 80°C @ 30 mm. Refractive index, n25/D 1.5190. Sp. gr., 1.055 @ 25°/25°. Soluble in the usual organic solvents. Insoluble in water.

Availability: Research quantities. (A-4)

para-Chloroethylbenzene

$Cl.C_6H_4C_2H_5$ Mol. wt., 140.61

Suggested Uses: As an intermediate for synthesis.

Properties: Colorless liquid. Boiling point, 179–180°C. and 84.5°C. @ 30 mm. Refractive index, n25/D 1.5152. Sp. gr., 1.044 @ 25°/25°. Soluble in the usual organic solvents. Insoluble in water.

Availability: Research quantities. (A-5)

Copper Phthalate

$C_6H_4(COO)_2Cu$ Mol. wt., 227.63

Suggested Uses: Fungicide.

Properties: Fine blue powder. Bulk density, 25#/cu. ft. Assay, minimum 95%. Insoluble in common organic solvents or water.

Availability: Pilot plant quantities. (A-6)

Diethyl Phosphite

$(C_2H_5)_2HPO_3$ Mol. wt., 138.11

Suggested Uses: As a solvent, paint remover and intermediate for synthesis.

Properties: Colorless liquid. Boiling point, 92°C. @ 30 mm. Sp. gr. 1.0912 @ 0°/0°. Refractive index, n 25/D 1.4055. Miscible with most organic solvents except long chain aliphatics. Soluble in and gradually hydrolyzes in water.

Availability: Research quantities. (A-7)

Hibitite® L

$C_{27}H_{45}NO_{10}S_2$ Mol. wt., 607.77

Suggested Uses: Metal pickling inhibitor.

Properties: Brown liquid. Boiling point, 1.2% wt. loss @ 200°/5 mm. Sp. gr., 1.16 @ 15° C./15° C. Refractive index, n 20/D, 1.5275. Assay, 95% (minimum). Limited solubility in dilute mineral acids, and diethyl ether. Soluble in ethanol, acetone, dioxane, benzene, $CHCl_3$ and CCl_4. Insoluble in H_2O and petroleum ether.

Availability: Pilot plant quantities. (A-8)

Lustrex

Suggested Uses: Opens up an entirely new group of uses for plastics, permitting them to be immersed in boiling water.

Properties: Heat resistant polystyrene. Injection molding temp. 350°–620°F. Molding pressure p.s.i. 10,000 and up. Sp. gr., 1.05. Flexural strength, p.s.i. 1200–14,000. Flexural deflection, inches, 0.15–0.25. Impact strength, ft. lbs. per inch (unnotched) 3.2–3.6. Heat distortion temp. °C. (Air bath) 87–88½. Dielectric constant, 1 megacycle, 2.5–2.7. Power factor, 1 megacycle. 0.0001–0.0005. Water absorption, % (24 hrs.) 0.04–0.05. Chemical resistance, no effect from weak acids and bases or strong bases. Strong oxidizing acids attack. Soluble in ester, aromatics, higher alcohols, chlorinated hydrocarbons. Color possibilities, almost unlimited. Usually can be molded in cycles up to 30% faster than that required for ordinary polystyrene.

Availability: Commercial quantities. (A-9)

Mortone WB-2

Suggested Uses: For use as a precoat on paper to be subsequently coated with light-sensitive solutions. The precoat increases brilliancy and depth of color after development, and reduces wastage due to overexposure.

Properties: A milky white silica aquasol (15% SiO_2), pH 9.0–9.5.

Availability: Commercial quantities. (A-10)

Mim Acid Phosphate

Properties: Mixture composed mainly of mono and di acid phosphates of methyl isobutyl carbinol. Sp. gr., 1.05 @ 25° C. Acidity, 300 mg KOH per gm. Light brown syrupy liquid.

Availability: Pilot plant production. (A-11)

N-1540

$C_{27}H_{22}O_2N_4S_6$ Mol. wt., 626.87

Suggested Uses: Rubber accelerator.

Properties: Cream colored powder. Melting range, 223–227°C. Sp. gr., 1.46. Assay, not less than 95%. Very slightly soluble or insoluble in ethyl alcohol, butyl alcohol, ethyl acetate, acetone, chloroform, carbon tetrachloride, carbon bisulfide, benzene, toluene, ether and naphtha. Soluble in hot chlorobenzene and o-dichlorobenzene.

Availability: Pilot plant quantities. (A-12)

N-3411

$C_{19}H_{21}NO$ Mol. wt., 279.37

Suggested Uses: Antioxidant for GR-S Latex.

Properties: Gray powder. Melting point, 124°C. Sp. gr. 1.133. Assay, 98%. Soluble in acetone, benzene, toluene.

Availability: Pilot plant quantities. (A-13)

Santocel® C

Suggested Uses: Used as a flatting agent to produce matte finishes in coatings of all types (lacquers, varnishes, vinyl resin coatings and resin dispersions); as a bodying agent for printing inks and non-aqueous liquids; as a bulking agent and free-flowing aid for dry powders; as an insecticide for stored grain insects; to aid in application of rubber cements; and as a reinforcing agent in rubber compounding.

Properties: Dry bulk density, 6 pounds per cubic foot. Sp. gr., 2.2. Index of refraction, 1.464. pH, 3.5 to 4.0. SiO_2, 89.5% to 91.5%. Oil absorption, too high for conventional test methods. Average particle size, 3 to 5 microns in diameter.

Availability: Commercial quantities. (A-14)

News of Monsanto Chemicals for the Process Industries...November, 1947

Santolite* HLA

Suggested Uses: In lacquers makes films that are clear, colorless and of good gloss and adhesion. Decreases water permeability and increases tensile strength.

Properties: Aryl sulfonamide—formaldehyde condensation resin. A clear, hard brittle, nearly colorless resin. Refractive index (25 gm. resin in 75 gm. normal butyl acetate) approximately 1.43 @ 25°C.

Availability: Commercial quantities. (A-15)

Sodium Phosphite, Di (Anhydrous)

Na_2HPO_3 Mol. wt., 125.98

Suggested Uses: As a mild reducing agent in neutral solution humectant, detergent additives.

Properties: Melting point, decomposes @ 130°C. pH 2% solution, 7.0. White crystalline hygroscopic powder. Assay, 63–65% H_3PO_3.

Availability: Laboratory quantities. (A-16)

Sodium Phosphite, Hemibasic

$NaH_2PO_3.H_3PO_3$ Mol. wt., 186.00

Suggested Uses: Convenient source of phosphoric acid in solid form.

Properties: Melting point, 156°C. pH 2% solution, 1.9 White crystalline powder, slightly hygroscopic. Assay, 87/% H_3PO_3.

Availability: Laboratory quantities. (A-17)

Sodium Phosphite, Mono (Anhydrous)

NaH_2PO_3 Mol. wt., 103.99

Suggested Uses: As a mild reducing agent, humectant, detergent, additive.

Properties: Melting point, decomposes 250°C. pH 2% solution, 3.9. White crystalline hygroscopic powder. Assay, 76–78% H_3PO_3.

Availability: Laboratory quantities. (A-18)

Tetraethyl Pyrophosphate

Suggested Uses: Insecticide.

Properties: Pure product has probable formula $(C_2H_5)_4\ P_2O_7$. Technical product is mixture of this and related esters. Light, straw colored, mobile liquid. Sp. gr., approximately 1.2. Completely miscible with polar and aromatic solvents and immiscible with paraffinic hydrocarbons. Has a high degree of biological activity, apparently through the inhibition of cholinesterase. Gradually hydrolyzes in presence of water, with accompanying decrease in toxicity.

Availability: Experimental quantities to qualified testing agencies. (A-19)

meta-Tolylene Diisocyanate

$CH_3.C_6H_3(NCO)_2$ Mol. wt., 174.15

Suggested Uses: Organic synthesis, textile-treating processes, polymers and plasticizers.

Properties: Boiling range, 82–85°C. @ 1 mm. Melting range, 19.6–21.8°C. Odor, medicinal. Color, clear, colorless to yellow.

Availability: Pilot plant quantities. (A-20)

meta-Toluic Acid

$CH_3.C_6H_4COOH$ Mol. wt., 136.14

Suggested Uses: As an intermediate for synthesis.

Properties: Crystalline solid. Melting point, 111–113°C. Boiling point, 263°C. Sp. gr., 1.054 @ 112° / 4°C. Very soluble in ethanol and ether. Soluble in 1170 parts of water at 15°C. and in 60 parts of water at 100°C. Is volatile with steam. Sublimes.

Availability: Research quantities. (A-21)

ortho-Toluic Acid

$CH_3.C_6H_4COOH$ Mol. wt., 136.14

Suggested Uses: As an intermediate for synthesis.

Properties: Crystalline solid. Melting point, 107–108°C. Boiling point, 259°C. @ 751 mm. Sp. gr., 1.062 @ 115°/ 4° C. Soluble in hot water, and benzene. Very soluble in ethanol. Is volatile with steam.

Availability: Research quantities. (A-22)

para-Toluic Acid

$CH_3.C_6H_4COOH$ Mol. wt., 136.14

Suggested Uses: As an intermediate for synthesis.

Properties: Crystalline solid. Melting point, 181°C. Boiling point, 274–275°C. Very soluble in methanol, ethanol and ether. Sparingly soluble in water. Is volatile with steam and sublimes.

Availability: Research quantities. (A-23)

Tributyl Phosphite

$(C_4H_9)_3PO_3$ Mol. wt., 250.32

Suggested Uses: As a stabilizer, antioxidant and intermediate for synthesis.

Properties: Colorless liquid. Boiling point, 121–123°C. @ 8 mm. Sp. gr., 0.9253 @ 20°/4°. Miscible with the usual organic solvents. Immiscible with water. Gradually hydrolyzes in contact with water.

Availability: Research quantities. (A-24)

Triethyl Phosphite

$(C_2H_5)_3PO_3$ Mol. wt., 166.13

Suggested Uses: Stabilizer, antioxidant, solvent and intermediate for synthesis.

Properties: Colorless liquid. Boiling point, 157°C. Sp. Gr., 0.9605 @ 17°/0°. Miscible with usual organic solvents. Immiscible with water. Gradually hydrolyzes in contact with water.

Availability: Research quantities. (A-25)

Sodium 2, 4-Dichlorophenoxyacetate

$Cl_2.C_6H_3OCH_2COONa.H_2O$ Mol. wt., 261.05

Suggested Uses: Herbicide.

Properties: White powder. Assay as monohydrate, 97.0% minimum. Total water, 5%–8.5%. Free alkali as NaOH, 0.2% maximum. Inorganic chloride as NaCl, 0.8% maximum. Water-insoluble matter, 0.1% maximum. Dichlorophenol, 0.1% maximum.

Availability: Commercial quantities. (A-26)

Phenylacetic Acid

$C_6H_5CH_2COOH$ Mol. wt., 136.14

Suggested Uses: Penicillin precursor, perfume base and pharmaceutical chemical.

Properties: Fine white crystals. Assay, 99.0%. Melting point, 76–77°C. Moisture, 0.2% maximum.

Availability: Commercial quantities. (A-27)

2,4-Dichlorophenoxyacetic Acid

$Cl_2.C_6H_3OCH_2COOH$ Mol. wt., 221.04

Suggested Uses: Herbicide.

Properties: Fine white powder. Assay, 99.0% minimum. Melting point, 138.0°C. minimum to start. Water, 0.5% maximum. Ash, 0.2% maximum. Dichlorophenol, 0.5% maximum.

Availability: Commercial quantities. (A-28)

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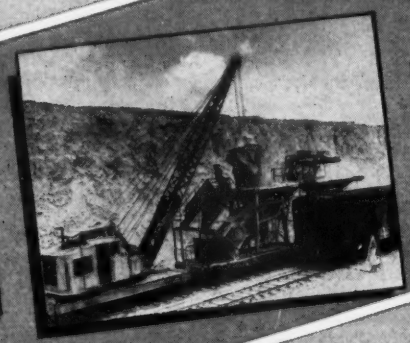

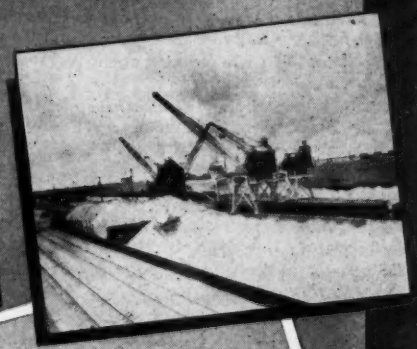

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Chemical Industries

THE MAGAZINE OF THE CHEMICAL PROCESS INDUSTRIES

For Your Information:

Newsletter
Nov. 1, 1947.

Within the next few months you will hear a good deal more about certain research and developmental projects, being conducted by the Office of Rubber Reserve, that may yield polymers better than standard GR-S. The key: low-temperature polymerization. The Office has already approved the installation of refrigeration facilities at the Copolymer Corp., Baton Rouge, La. When these polymers are made under full-scale production conditions, they will be made available for evaluation by the rubber industry.

The old, established process for producing ethanol from ethylene via sulfuric acid hydration is due for some competition. Shell Chemical Co. is building a new plant which will utilize catalytic hydration. The old process is good; the new should minimize corrosion difficulties, eliminate acid recovery problems.

* * * * *

Although officials of Procter & Gamble will not comment on reports that the company plans to enter the cosmetic field, the odds are that P & G will plunge into the business next year. Indications are, however, that the company will develop its own line (rather than follow the lead of Lever Bros., which bought Harriet Hubbard Ayer). The first item the soap concern will promote will probably be a cold cream, due to appear on the market early next year.

In the near future you can expect to hear more about a novel type of zirconia refractory which Titanium Alloys Manufacturing Co. is developing and is now testing. The new product, tagged by TAM as a "stabilized" zirconia, is said to be particularly resistant to spalling. The secret: minimization of the volume change, which normally takes place at about 1000°C. If test samples, of which a few have been distributed, live up to expectations, zirconia will compete performance-wise with relatively expensive thoria and beryllia. Some possible uses: high-temperature pebble furnaces, linings for gas turbine combustion chambers, etc.

* * * * *

The Records Industrial Research Laboratory of Tacoma, Wash., is currently building and will soon start operating a new plant for the low-temperature carbonization of coal at Wellington, Utah. The process: coal is charged into inclined retorts, subjected to high-pressure steam which drives off the volatiles, leaves a char residue. Consideration is also being given by the same company to establishment of a similar plant at Renton, Wash., near Seattle, in an effort to revive the coal industry in that area. Several large chemical companies are said to be interested in contracting for the entire output of tar from the Utah plant.

Well worth observing are the plans being made by a number of companies that augur a substantial upping of maleic anhydride output. Carbide and Carbon Chemicals Corp. will re-enter the maleic picture next year. Monsanto Chemical Co. is building a new facility, and Reichhold Chemicals Co. brought in additional capacity this month. Other concerns are also weighing maleic possibilities, particularly several phthalic makers who are presently pinched for naphthalene.

* * * * *

An interesting report on the Du Pont Co.'s long-secret but much-discussed Fiber A will soon be forthcoming from the company's Rayon Dept. Incidentally, Du Pont is pushing laboratory work on terephthalic acid, which may fit into the company's operations as a raw material for nylons and/or the I.C.I.-developed textile fiber, Terylene. (CI, May '47, p.764.)

It may take a year for plans to crystallize, but one West Coast chemical producer is seriously considering establishment of a new electrolytic chlorine plant at a location closer to the Los Angeles market than either Pittsburg, Calif., or Henderson, Nevada, the present nearest production points. There are several possible sources of salt for a chlorine-caustic operation in Southern California.

A significant departure from conventional dextrose-manufacturing operations will be effected at the new Corpus Christi plant of Corn Products Refining Co. At present, all U. S. dextrose makers employ batch methods, but CPR is installing a continuous process for the hydrolysis of starch to dextrose.

Although no official announcement has been made as yet, Heyden Chemical Corp. may enter the resorcinol business. Samples of Heyden-produced material have been submitted to several major consumers.

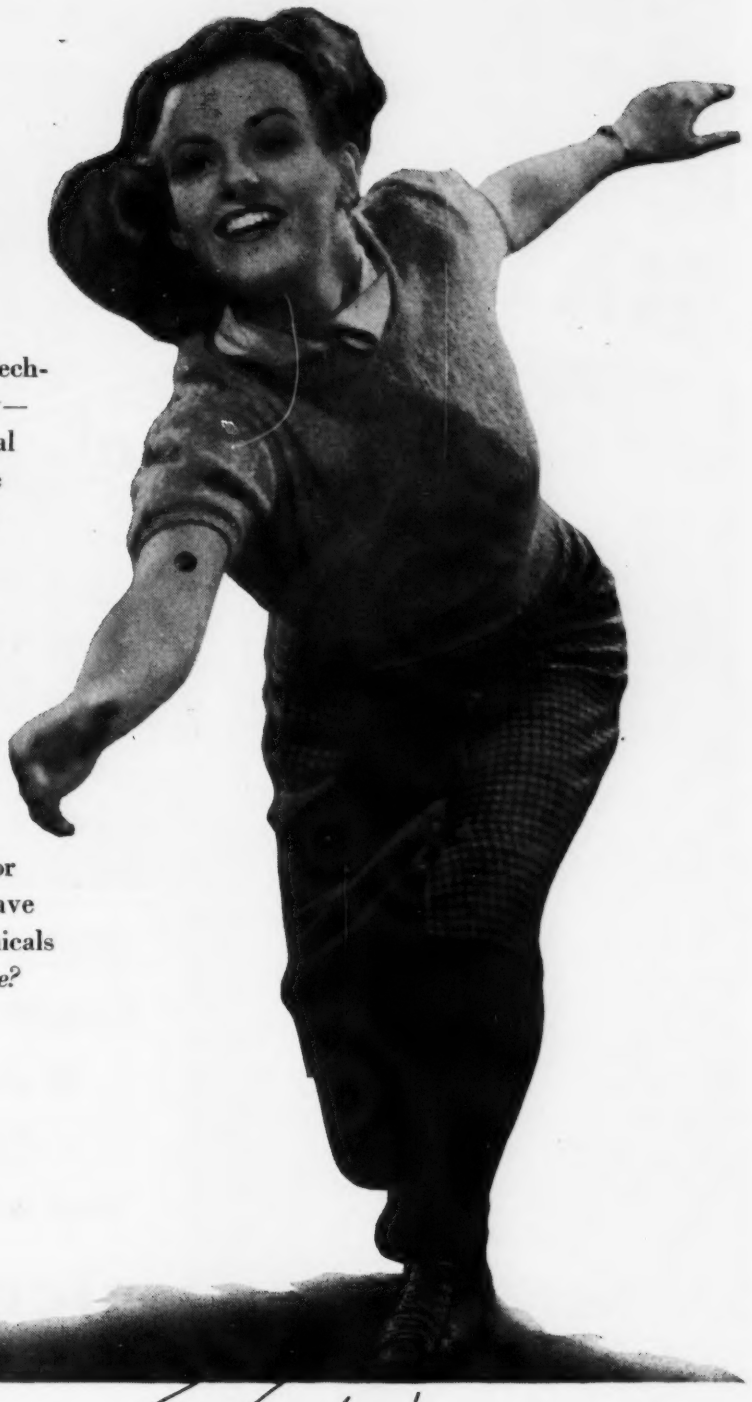
* * * * *

Here and There:

Atlantic Refining Co., long active in the synthetic detergent field, is expanding facilities to boost output of alkyl aryl sulfonates. Also planned: increased production of microcrystalline waxes ... The Permanente Metals Corp. aluminum reduction plant at Tacoma, Wash., is in the process of reopening after a two-year shut-down. The increased demand for aluminum for alloying and export is given as the reason for this resumption of activity ... A major chemical manufacturer, holding interests in the retail pharmaceutical field, is quietly pushing plant studies on the production of saccharin ... Among the products which Koppers Co. will make at Oil City are 2,6-ditertiary butyl-para-cresol; 4,6-ditertiary butyl-meta-cresol and 4-tertiary butyl-meta-cresol. Main outlets: synthetic rubber compounding ... Early in 1948 Niacet Chemicals will complete construction of a new unit to augment output of vinyl acetate ... Crystalline abietic acid is one of the new products to which Armour & Co. is paying particular attention. The abietic project is, at the moment, in the developmental stage ... Robert Smith Mfg. Co., Los Angeles, which has been marketing a detergent under the tradename of Nylon Dip, is now introducing two new packages to be distributed through hosiery and other variety stores ... Diamond Alkali Co. has purchased 1700 acres of land (over-bearing salt strata) at Eleanor, W. Va.

The Editors

FOLLOW-THROUGH!



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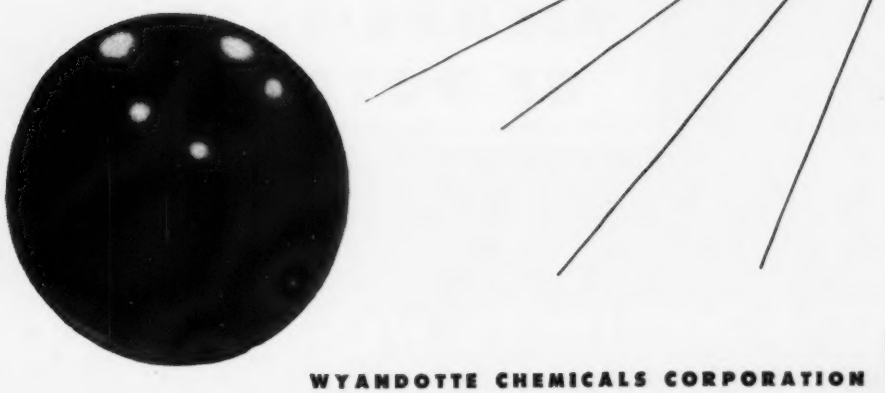

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Editorial

INORGANIC CHEMISTRY TO THE FORE

by ***ROBERT L. TAYLOR, Editor***

IT IS TIME, it seems to us, that somebody mounted a white horse and took it upon himself to wave the flag and blow the trumpet a bit for inorganic chemistry and technology. Organic chemistry has so long monopolized the chemical limelight in this country that some of our inorganic friends seem almost to have acquired professional inferiority complexes. How many chemical medalists of the last ten years have been inorganic men? How many of our colleges are noted for their excellence in inorganic chemistry? How many chemical companies have built recent major expansion programs around new inorganic products? It is doubtful if more than the fingers of one hand would be needed for the answer to any one of these.

Like everything else, chemical development has its cycles and its fads. The organic era in which we have been for the past twenty years has written and is still writing the most astounding of all the chapters of chemical history. It has literally produced chemical miracles. Even the most extravagant of the chemical soothsayers at the end of World War I did not foresee the full extent of the great organic developments that were just over the horizon—the new plastics, motor fuels, lubricants, fibers, protective coatings, medicinals and others that are now so common as to be taken for granted and which last year accounted for an organic chemicals production many-fold that of the early 'twenties. The organic chemists and chemical engineers deserve all the credit and applause they have been getting.

But at the same time there is little doubt that this applause has dulled the luster and attraction of the inorganic branch of chemical science, both for chemical company managements and for young men entering the chemical profession.

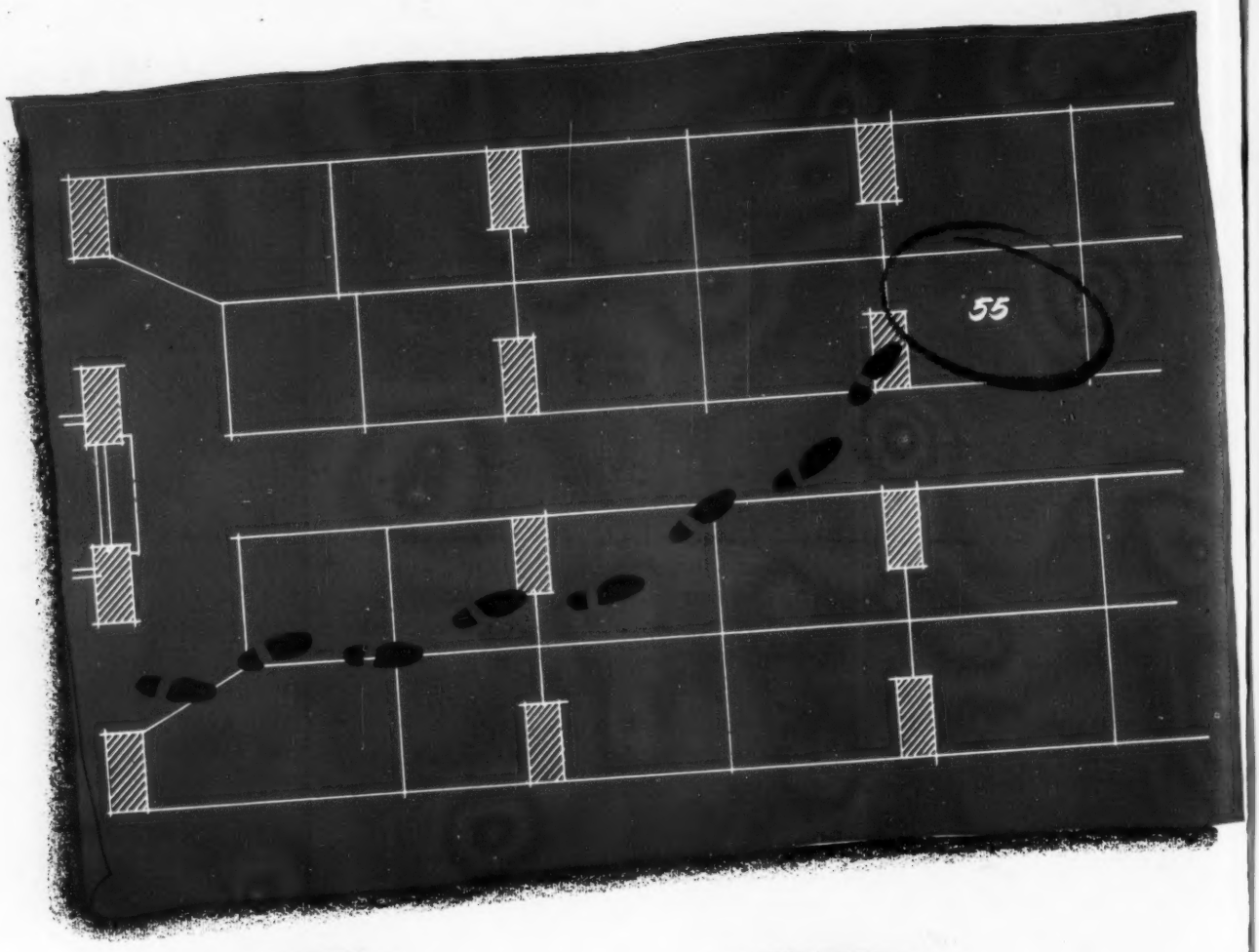
The number of graduate degrees conferred for work in inorganic fields of specialization in recent years have been small indeed in most colleges. One chemical manufacturer whose operations are based almost entirely on phase rule chemistry has had so much difficulty getting men who are proficient in this important field that it has taken to training them itself.

Probably those chemical producers who have a special interest in inorganic materials have been as much to blame as anyone for this situation. With some exceptions, they have not been as aggressive in research and development as most of the companies whose operations are based on organic materials. They have been less inclined to take the initiative in opening new markets for their products. Until fairly recently they have been content to leave anything containing a carbon atom to their "more experienced" organic contemporaries.

It is healthy that more of the traditionally inorganic companies are now actively expanding in directions involving the combination of their products with organic materials. They have much to contribute in such combinations. In so doing, however, it is important that they do not go so far as to let the organic phases of their work crowd out the inorganic. The possibilities of combining the forces of inorganic and organic chemistry are infinite, but each must be accorded a position of equal stature with the other. One cannot dominate, or many of the potential advantages of the combination will be lost and progress will be slow or lopsided.

The organic phosphorus compounds offer an excellent example of what can be done along this line. But even in this group, which has been undergoing investigation for a number of years, no more than the surface possibilities have been scratched. The future is still but vaguely charted for such combinations as the organic silicons and the broad range of metallo-organics. Fluorine chemistry is in its earliest stages, and the great area that represents the boron compounds is virtually without maps of any kind.

Chemical industry thus has much to gain from a strong development of inorganic chemistry, from the standpoint of what it can contribute alone and, probably more important, in combination with organic chemistry. In fact, it may be that there is a place for a new type of specialization in chemistry, one which emphasizes neither organic nor inorganic study but rather a combination of the two.



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What's new

VINYLS PREPARE TO ASCEND

The growth of vinyl plastics in the past eight years has been nothing short of phenomenal—and it's not over yet. Chief hurdle to higher output is the shortage of good plasticizers, but that restraint will soon be cast off.

FOR EVERY pound of vinyl resin made in 1939, roughly 200 pounds will be made this year. Such a state of affairs is heaven for plastics producers, but it's heaven with headaches. A major source of these headaches is the frank shortage of many of the more desirable plasticizers—a situation which is causing real concern within the industry.

The ideal vinyl plasticizer, of course, is still a chemist's dream. No known material or combination of materials is ideally non-migratory and efficient, conferring low-temperature flexibility and high-temperature resistance together with all other desirable properties, all at the same time.

But some plasticizers come a good deal closer to the ideal than others, and fabrication of high-quality consumer items is impossible without them.

The Summer Slump

Last summer's slump in vinyl sales is a case in point. The major culprit was overstocked inventories; but an accessory to the crime, it appears, was shoddy merchandise. Opportunists, unable to buy or unwilling to pay the price for good plasticizers, used inferior materials. Shower curtains cracked; handbags left stains on varnished table tops; consumers lost their faith in advertising-copy promises.

Fortunately, the slump was temporary, and it appears that the year 1947 will be a whopper for vinyl sales. But as a result of the high sales, plasticizers are still in short supply, although the situation is due for improvement.

Vinyl Growth

For the first 14 years of its life, the vinyl business was a retarded baby. The first commercial resin was made in 1927, but in the year 1939 only 1,200,000 lbs. of vinyls were produced. But in 1946, production was 145,000,000 lbs., and this year's output will probably top 200,000,000.

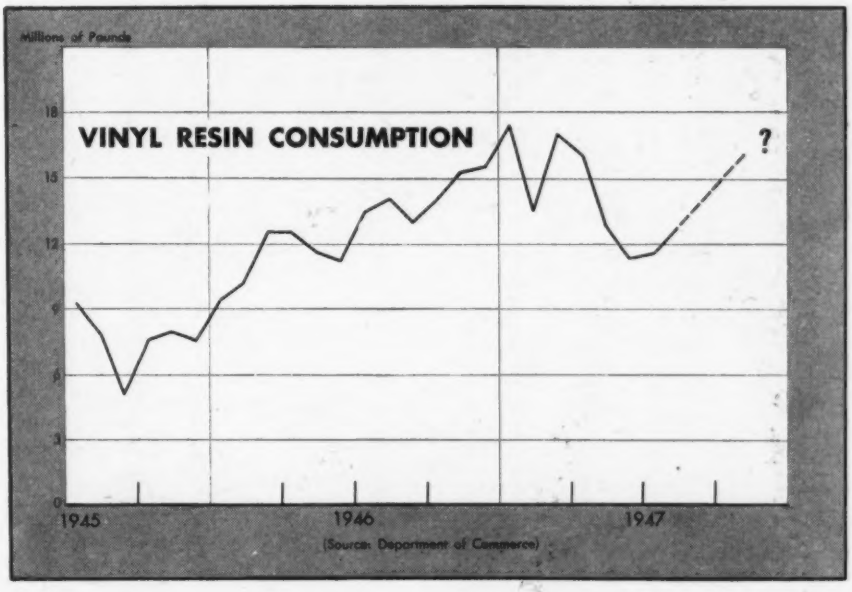
Frank Schoenfeld, B. F. Goodrich Chemical Co. vice-president, figures that vinyls are the basis of a billion-dollar industry: The estimated 1947 tonnage represents roughly an $80,000,000 sales volume, to which must be added another $40,000,000 for plasticizers and other supplementary materials. The processor of semi-finished goods must double the dollar value—to $250,000,000—to cover his profit and cost of operations. The finished goods are probably sold to retailers for half a billion, and the ultimate consumer, in that event, pays a cool billion. Thus the vinyls pyramid to a sizable segment of the national income.

But it doesn't stop there. Next year's goal is 350,000,000 lbs., and it is expected to keep on growing. Ken Craver, plasticizer coordinator in Monsanto's Organic Division, expects plasticizer demand to go to 250,000,000 lbs. per year. That would take care of 5-600,000,000 lbs. of vinyl resin. Monsanto and Glenn L. Martin are both building polyvinyl chloride plants, and other producers as well are expanding their facilities.

Plasticizers Follow Pace

What about those 250,000,000 lbs. of plasticizers? They're not forgotten, as indeed they can't be, in the growth of vinyls.

Vinyl plasticizers fall into two broad categories: monomeric and polymeric. The monomers account for the major share of the tonnage, and of those dioctyl phthalate is probably the largest single item. Right now the supply is short and continually worsening. Carbide & Carbon



VINYL DEMAND: Up and up it goes

hopes to complete its plant by next summer.

The other large group of monomer plasticizers is the phosphate esters. Monsanto is planning to build several large plants to turn out phosphates (CI Newsletter, September 1947 issue), and Carbide has just completed a plant to make trioctyl phosphate; right now output is held back by material shortages, and operation is only 35 per cent of capacity.

Newest development in the field is Carbide's dioctyl tetrahydrophthalate. This compound is made, not from phthalic anhydride, but from maleic anhydride and butadiene (Diels-Alder addition product). It will therefore be independent of the variable price and supply of phthalic anhydride. A maleic anhydride plant has been built to supply that component.

But all of the excitement isn't about monomers. Some polymeric plasticizers, like the alkyd resin-type Paraplexes, have been used for a comparatively long time. Now vinyls are being copolymerized with butadiene-acrylonitrile rubber to give internally plasticized products.

A New Career

This development, Standard Oil of New Jersey expects, will give the Buna-N type of synthetic rubber a career like it never had during the war. From 1942-46 Buna-N production averaged 24,000,000 lbs. a year. Ultimately, the company believes, from 40–60,000,000 lbs. will be used annually as an alloying ingredient with vinyl resins. Together with that blended with phenolics and that used alone, total output is expected eventually to reach 140,000,000 lbs. Standard is selling its brand, Perbunan, for those purposes, and Goodrich is blending its Hycar rubber with vinyl chloride to make Polyblend.

A lot of vinyl plastic is going into the uses which spurred its wartime expansion: wire and cable insulation, gaskets, belts, tank linings, flexible tubing, packaging, film, and the like. Consumer items such as upholstery, luggage, handbags, shower curtains and raincoats are still demanding a major share of the material.

Turning Up Everywhere

But new uses are constantly being found. Fad of the moment is Bub-O-Loon (CI, October, 1947, p. 612). This toy is now accounting for several tons of plastic a day and will eventually settle down to a comparatively small but steady business. More promising for the long haul is vinyl flooring, whose relatively high price is offset by its superior wearing qualities. Soles and other portions of footwear are more and more taking advantage of vinyl's sturdiness; and this represents a huge potential market.

Vinyls already have the highest dollar volume among all plastics, and it's a reasonable guess that they may also be heading for the top poundagewise. And it is obvious that where vinyls go, their plasticizers will accompany them. The next few years may see evolution and even revolution in the plasticizer field: There is increasing emphasis on flameproofness, and on non-migratory plasticization; customers pay 75¢–$1 per lb. now, but new types are being developed, with an eye to cheapness and availability. The plastics manufacturer may not worry about his Q's, but he has his P's firmly in mind: performance, permanence, and price. Any new plasticizer will have to pass that triple screening.

VINYL USES: Where it will end up, nobody knows.

ELSIE GOES CHEMICAL

Milk to casein to resins is a logical progression. But Borden's, strengthened by the acquisition of Durite Plastics, Inc., moves along a new line.

A FURTHER entrance of the Borden Co. into the plastics field is signalized by the recent acquisition of Durite Plastics, Inc. by Borden's Casein Company of America Division. This was carried out by an exchange of $3,000,000 in stock.

Previous to the amalgamation of Durite with Borden, Casein produced both synthetic resin adhesives and those manufactured from casein. Acquisition of Durite marks its first entry into the production of molding powders and solid resins and one more step into the chemical industry. The combination is particularly fortuitous in that both groups utilize the same raw materials for the production of certain different types of resinous products—formaldehyde, phenol and resorcinol. Operations of both organizations will continue with few, if any changes. The gross of the combined companies will be approximately $10,000,000 per year.

It Began in Egypt

History has recorded the use of casein, as such, by the Egyptians but is wasn't until the latter part of the nineteenth century that major uses developed in the United States. The Casein Co. of America was incorporated in March, 1900, to take over the already large business in casein cold-water powdered paints and the market for adhesive in the production of coated papers that had been developed by William A. Hall, its first president.

Casein's original plant was at Bellows Falls, Vermont. The first offices were established abroad in 1902 and casein was a major export item to Europe until the development of the casein production industry in Argentina.

During the next few years casein moved out into many new fields. It was used for leather finishing, production of oil cloth, calico printing, cloth sizing, and as a foodstuff.

Water Resistant Wood Glue

The next big step in the company's development was the creation of the first good cold-water soluble, water-resistant wood glue. This was brought out in 1916-17 and was first used for the construction of planes for the Air Forces of World War I. The uses for casein continued to expand, and the Casein Co. was absorbed by Borden Co. in 1929.

In 1935 interest turned from the casein-type adhesives to those based on synthetic resins—more specifically, the urea-formaldehyde type which were rapidly assuming importance in Germany. Final negotiations with the I. G. were completed in 1936 for a license under their patents and

production began in 1937. However, the licensing agreement was abrogated the same year because, as the contract was written it required that the licensor, the Unyte Corp., an I. G. affiliate, protect the patents from infringers. Another paragraph in the licensing agreement permitted Casein to sue infringers if Unyte did not choose to do so. When Unyte refused to take responsibility, Casein surrendered its license. By this time, however, the patents had only two years to run.

Casein began the production of a phenol-formaldehyde adhesive in 1940 and of a resorcinol-formaldehyde adhesive in 1942, the latter in connection with the production of wooden airplanes and boats for World War II.

Casein has four plants: General adhesives plants at Bainbridge, N. Y. and Seattle, Wash., a plant for the production of urea-formaldehyde resins for use in the production of furniture at Kernersville, N. C., and a plant for the production of formaldehyde by the direct oxidation of methanol and of synthetic resin adhesives for use in the production of plywood at Springfield, Ore. The new plant which has been added by the acquisition of Durite is located at Philadelphia, Pa. All of Casein's long-range research is carried on at Bainbridge, that of the Durite Co., in Philadelphia.

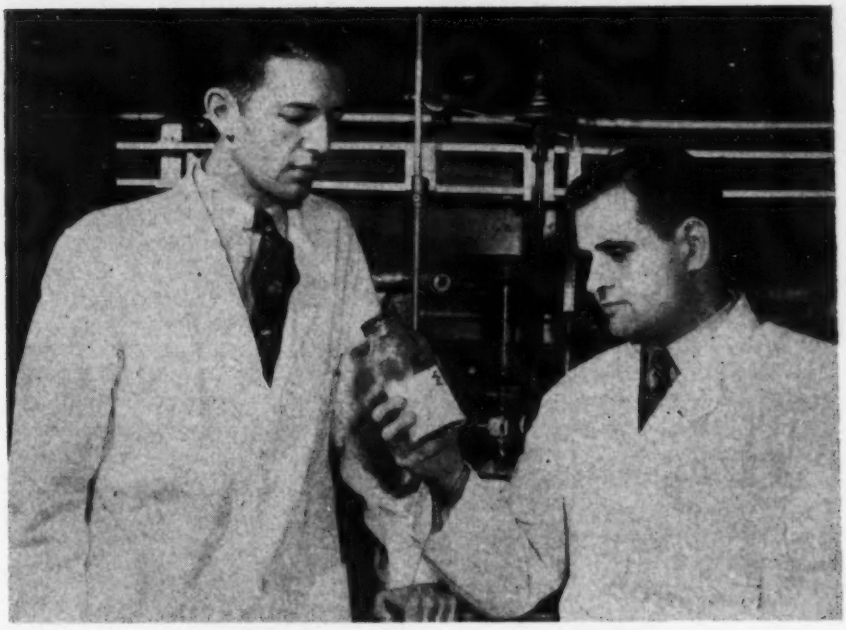
Durite

The Durite Co., under the management of Emil Novotny, was formed in 1920 by Stokes and Smith to produce phenol-formaldehyde resins to form plastic parts for its packaging machinery. The commercial value of furfural-phenol resins, in which production Durite was a pioneer, had been evaluated prior to 1920. However, lack of commercial quantities of furfural until 1922 (CI, Aug., '47, p. 209) prevented their use until that time. They became more and more important as the price of furfural was continually reduced from the initial $2.50 per pound to the present 9c per pound.

Furfural-phenol resins are used for the production of abrasive grinding wheels, for the impregnation of brake linings and clutch facings, and various items formed either by press or injection molding. These resins are distinguished by their chemical inertness and resistance to scorching at high temperatures. They can be made only in black or various shades of brown.

Durite's interest in resorcinol-formaldehyde extends back to the late twenties when their patents, which began to issue in 1930, were applied for. However, commercial production of this low-temperature adhesive did not materialize until 1943.

Few changes are anticipated for the new organization other than a very close coordination between the research laboratories. Emil Novotny, the former president of Durite, will continue to direct Durite's activities.



ALEXANDER SURREY (right): He caught the boat.

MALARIA MELEE

Just because the Pacific war is over doesn't mean that antimalarials are "dead ducks."

NOW READY for use are new antimalarial drugs far superior to those used during the war and for three centuries before. Pharmaceutical makers are poised, ready to manufacture pounds—even tons—of these therapeutic agents; they'll need tons of intermediates from the chemical industry; potential demand for the products is enormous.

A recapitulation of current facts and opinions in the field shows that prospects are bright, progress is sure, production is high. Especially since German industry, which formerly supplied most of the synthetic drugs, is down for the full count, American manufacturers are taking a keener interest in malaria, one of mankind's oldest and most oppressive burdens.

Formidable Enemy, Inadequate Weapons

Every year 3,000,000 people die of malaria, and they're only one per cent of the estimated 300,000,000 who contract it. Everyone in India, everyone in South China, a large proportion of those in South and Central America and Africa need some sort of treatment. Even Finland, as far north as Labrador, has known malaria during the summer months.

Quinine was the standard antimalarial for three centuries. It was the only one, in fact, until German chemists brought out plasmoquin in 1924. Although this compound cures relapsing malaria, it is very toxic; the curative dose is right at the toxic limit.

The next important antimalarial, atabrin, was introduced—also in Germany—in 1930. This compound, unlike plasmoquin, is not a curative but a suppressive. Although both of them were a useful adjunct to quinine, they were not enough better to warrant extensive manufacture in this country.

Came the war, and with it a thousand-fold-multiplied need for antimalarials as troops descended upon the tropical South Pacific. Atabrin, with new medical knowledge about its proper use, was made by the ton, and meanwhile every conceivably active compound—the total ran to 14,000—was tested by a committee set up under the Office of Scientific Research and Development.

Research Hits Pay Dirt

Out of this research came two new and better antimalarials: chloroquin and pentaquin. The former material was synthesized first in Germany, but the Germans missed the boat, didn't realize that they had something better than atabrin. Patents on the compound, seized by the Alien Property Custodian, are now owned by Winthrop Chemical Co., where Dr. Alexander Surrey has carried on the development work.

Pentaquin, a super-plasmoquin, was also uncovered by the OSRD.

Meanwhile the British were zealously prosecuting the search for better drugs—understandably, for a good part of the Empire is in malarious areas. In 1945 Imperial Chemical Industries looked very hard at laboratory sample No. 4888. After exhaustive trials it proved to be relatively non-toxic and powerfully effective. Most important, mosquitoes are unable to carry the infection from the blood of a victim taking the drug. Thus the lethal cycle is broken, and the possibility of eventually eradicating the disease has been opened up.

Paludrine, as the drug is known in

Great Britain, is now being made in this country by du Pont, which supplies the material to drug houses such as Abbott, Squibb, Lilly, etc., for distribution. It will probably be known in this country as chlorguanide; that name is now up for consideration before the American Medical Association's Council on Pharmacy.

War's Over, Malaria Isn't

Although the war is over, the problem of malaria—even in this country—is still rampant. The Tennessee Valley Authority has done a good job of clearing up malaria in our southern states, where it was formerly a serious menace; but there are quite a few returned servicemen with the disease and there is a constant traffic between our shores and our tropical outposts. A distressing aspect of the problem is that many ex-servicemen are indifferent, to say the least, about treatment.

But beyond our shores, our country is committed to maintain many people in malarious regions: Puerto Rico, for one, and other Caribbean and Latin-American countries. Furthermore, it is estimated that the productivity of such malaria-ridden countries as India and China could be increased 100 per cent if that debilitating disease were controlled. If the United States is going to embark on a program to provide billions for foreign relief, some people think that malaria control is an investment which, by making other nations more productive, would be an economy in the long run.

DDT No Cure-All

For a while, DDT seemed to be the answer to every parasitologist's prayer: just kill all the mosquitoes and—presto!—stamp out malaria. But in Puerto Rico, where that was tried, the DDT fell on the sugar cane, the cane tops were fed to cattle, the DDT was concentrated in the cream and eventually ended up in the butter, and the butter was dangerous and unfit for consumption. In Greece DDT killed the honey bees and played havoc with the wineries. It also killed beneficial parasitic insects, allowing harmful ones to multiply unchecked.

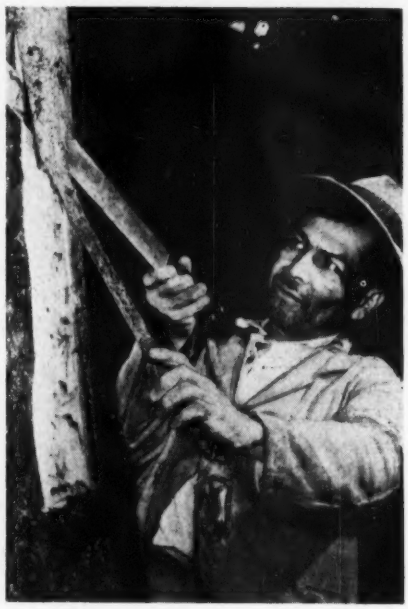
DDT is excellent under certain controlled conditions, but it is by no means the panacea for malaria control—particularly in densely populated and agricultural areas.

What can be done in the way of stamping out malaria has been spectacularly demonstrated in Venezuela. Two years ago, before Dr. Arnaldo Gabaldon started his program, in cooperation with the Board of Coordination of Malarial Studies and later with the U. S. Public Health Service, incidence of the disease was 40 per cent. In one county only suppressive drugs (chiefly chloroquin) were used; all other counties were sprayed with DDT, and in them no drugs were administered. Incidence was cut to 1 per cent in the DDT-counties and 0.4 per cent in the drug-county. Success was obviously phenomenal, but it cost that oil-rich country a staggering sum.

Large Demand—But

Every country in the malaria belt could do as well, and the job would require 7,000,000 lbs. of suppressives and 200,000 lbs. of curatives together with 6,000,000 lbs. of quinine, which acts as a synergist with the curative-type drugs. These figures are estimated on the basis that half of the two billion people in the world should have 13 grams each of suppressive drugs per year. Roughly half of that number need 0.8 gram apiece of curative drugs together with quinine.

But that would take money. Moreover, such a program would require intensive control and, consequently, a lot of high-powered administration. It is obviously not a program that will be undertaken next week—or even next year.



CINCHONA STRIPPER: He synergizes the synthetics.

Meanwhile research is going on. The U. S. Public Health Service took over where the OSRD left off, picking up the loose ends and forging ahead with new research.

To date the approach has been largely empirical: try thousands upon thousands of compounds and study the best ones, a major difficulty has been that there is no incontrovertible screening test. Birds have been used, but bird malaria isn't exactly equivalent to the human disease. Now a new monkey malaria, which appears to be very much like the human manifestation, is being studied; and hopes are high that more rapid progress will be made with these animals.

Also, a more fundamental approach is being undertaken. What is the course of events within the human body after a malaria-carrying mosquito bites? Do the parasites produce toxins which interfere with bodily function? What functions? Questions like these are in the province of biochemists, and on them falls the mantle of responsibility for attacking the problem at its source. Such investigations are now under way, and positive results should accrue within a few years.

Present Demand High

Meanwhile, production of current antimalarials is proceeding as fast as raw material supplies allow. An indispensable raw material, for example, is *m*-chloroaniline, made by Monsanto Chemical Co. Monsanto's strike last year upset production schedules, and manufacture of this small-tonnage item is still not back to normal.

Makers of antimalarials could, of course, produce themselves out of business. If they could make enough and—more important—if malarious people could afford enough, the need for malaria drugs would soon cease to exist, and a centuries-old scourge would pass from the earth. This happy state of affairs is, unfortunately, beyond our immediate grasp; and as a result antimalarials, and continued antimalarial research, are here to stay for a long, long time.

HEATLESS HELIUM

A simpler, slicker piece of equipment for producing close-to-absolute-zero temperatures is spurring important research.

IN COMMON with all investigators engaged in research requiring very low temperatures, Dr. Samuel Collins, of the Massachusetts Institute of Technology, was forced to devote the major portion of his attention to the equipment needed for reaching those low temperatures. However, he was not satisfied with this state of affairs and eight years of study resulted in the production of a new and improved cryostat. Full engineering details were first described in a paper presented before the recent meeting of the American Institute of Chemical Engineers at Detroit, Michigan.

The equipment which had previously been required for the production of liquid helium was a high-pressure cascade system of refrigeration, whereby the heat which must be removed in the liquefaction process is carried off by liquid hydrogen, which in turn is cooled by liquid air. Such an installation is both hazardous and expensive, costing over $100,000, and introduces severe maintenance problems. This situation accounts, to a certain extent, for the fact that there were only four helium liquefying installations in North America before the first of the new cryostats went into use early this year.

As is the case in most new developments, Dr. Collins' first trial can only be called a failure. In 1939 he built a helium

SAMUEL COLLINS: A super ice-box makes zero cheaper.

liquefier using a diaphragm expansion engine through which compressed helium lost enough energy to liquefy. But the problem of leaks in the piping, which was in a vacuum, proved too great. Because of his interest in equipment utilized for attaining low temperatures, Dr. Collins' work during the war was directed toward the liquefaction of air for the production of oxygen. In this work he developed a piston-and-cylinder expansion engine using a flexible connecting rod in tension, which permitted a good alignment of the piston within the cylinder and permitted it to operate efficiently with no lubrication under the severe low-temperature conditions. After successful use of the engine in low-pressure oxygen generators it was later adapted for use in the cryostat.

Structure

The only refrigerating fluid used is helium, in contrast to the multiplicity of coolants required by the cascade system. The compressor, driven by a 10 HP electric motor, raises the pressure of the incoming helium to 200 psi in four stages. From the compressors the helium flows through a novel heat exchanger which cools the helium from room temperature to liquid helium temperature and yet weighs only a few pounds. Expansion engines are utilized for the final liquefaction step.

The refrigerating equipment and the cold space itself are housed in a steel vacuum jacket, 12" in diameter and about 5' tall. Experimental materials are introduced through an opening at the top of this jacket. If one wants to use liquid helium, it can be removed and kept for several hours in a double Dewar flask containing liquid air between the two concentric evacuated sections.

This unit can also be utilized to liquefy other gases.

After the operability of the cryostat had been proven, development of a design which could be regularly operated by laboratory technicians was undertaken by Arthur D. Little, Inc., under the supervision of Dr. Howard M. McMahon who had cooperated with Dr. Collins in the original work.

Design features added during the development include a means for compressing the helium in an ordinary lubricated compressor without contamination and for storing it at low temperatures without contamination. This lack of contamination avoids the use of a clean-up system, requiring a continuous supply of liquid air to freeze out impurities.

Research at extremely low temperatures can now be undertaken conveniently for the first time with the Collins helium cryostat, which can be operated by a laboratory technician and can maintain its space for experiments at any temperature down to 2° Kelvin or –456°F. Recognition of this situation is shown by the fact that within one year seven of these units have already been put in use, in contrast to the four units of the older type that were erected prior to the development of this device. Several more are in process of construction.

Research at very low temperatures is considered vital to a better knowledge of the properties of matter. At extremely low temperatures the masking effect of thermal motion of the molecules become less important and behavior in accordance with the laws of quantum mechanics becomes observable. By measurements at low temperature it is possible to obtain valuable data concerning the atomic nucleus and, in general, to determine how the fundamental particles within a material are situated and what forces hold them together or push them apart. Thermodynamic constants of materials can also be calculated from measurements at low temperatures and from these the true equilibrium state of chemical reactions can be computed.

NEVADA GAMBLE

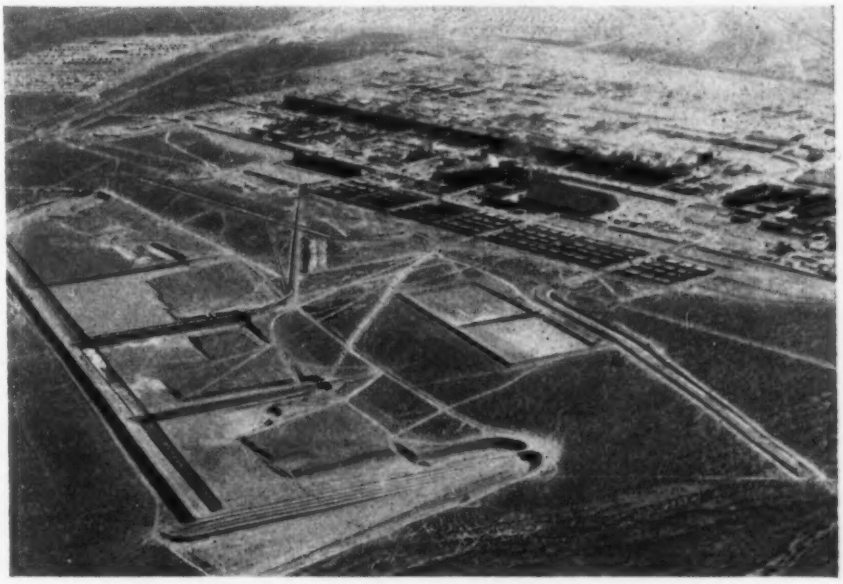
Long shot may be the word for Henderson, Nevada, as a potential major chemical producing center. But in a gambling state anything can happen, and often does.

IN THE two years since the war, the former Basic Magnesium, Inc., plant at Henderson, Nev., which draws its power from nearby Boulder Dam, has probably been the subject of more speculation as to potentialities for peacetime chemical production than almost any other war-born chemical operation. Nine chemical companies have already leased about a third of the $140,000,000 property from War Assets Administration, the present owner, and established a variety of operations. But despite this fact, uncertainties in the picture have continued to give rise to predictions ranging from undisguised skepticism to rosy optimism as far as Henderson's permanent place in the chemical economy of the nation is concerned.

Just within recent months, however, developments have indicated that two of the most major of these uncertainties—power rates and ownership—are likely to be removed in the not-too-distant future.

Nevada to Take Over

The state of Nevada, through its agency, the Colorado River Commission, has signed a letter of intent to the effect that it will take over the utilities contract for the Henderson project on January 1, 1948. Under the terms of the Boulder Canyon Project Adjustment Act, which governs the withdrawal of power from Boulder Dam, the State of Nevada is entitled to 18 percent of the power from the dam. Thus far Nevada has not installed generating capacity to exercise



Basic Magnesium: Center of Nevada chemical industry.

this right, with the result that since the war Henderson and the BMI lessees have had to buy their power from California which, although it comes from the dam, is charged at the California rate of 4.8 mills. With the installation of generators by Nevada it is expected that the rate to the Henderson area will fall back eventually to about 3.2 mills, or the same as that charged BMI during the war when it was operated by the Federal government. Such a rate would make Henderson one of the lowest cost power sites in the country. Installation of generators will take about three years to complete.

A Definite Offer

Although there has yet been no commitment as in the case of the power, it is a strong likelihood that Nevada may also soon purchase the plant itself from WAA with the thought of using it as a nucleus for the industrial development of the southern part of the state. At any rate WAA has made a definite offer, restricted to the State of Nevada, of the entire project for the sum of one dollar plus a percentage of the income from leases. Under permanent ownership it is felt that the job of administration could be accomplished more efficiently than with the temporary set-up now in effect and thus permit more favorable leasing arrangements. If this can be done, and at the same time the rate assured, the present lessees feel that the location may well develop into the major electrochemical production center serving the West.

Current Operations

The oldest of the present BMI tenants are Stauffer Chemical Co. and Western Electrochemical Co., both of Los Angeles and both of which signed leases to operate part of the facilities very shortly after the end of the war.

Western Electrochemical is making sodium and potassium chlorates and potassium perchlorate electrolytically in a plant it constructed for the government for production of these materials at the BMI site during the war. Combined capacity for the three products is 1200 tons per month, which is about six times the capacity of the company's similar plant in Los Angeles. Raw materials are rock salt, obtained by rail over a 200-mile haul from Amboy, Calif., and potassium chloride obtained from Trona, Calif., and Carlsbad, N. Mex.

Recently Western started producing some ammonium perchlorate as well. It is also currently recovering manganese sulfate from residues left from the former manganese plant of the Manganese Ore Co. which operated at Henderson for a short time during the war. The chlorate plant contains 700 carbon electrode chlorate cells which operate at 3.5 v. and 5,000 amp. and a smaller number of platinum electrode perchlorate cells. Fred D. Gibson is in charge of the plant.

Stauffer Chemical Co. is now operating two-thirds of the original 900 Hooker S cells in the two Basic Magnesium chlorine-caustic units. As in the case of Western, salt is shipped in from Amboy, Calif. Some of the chlorine is used on the premises by other tenants, but most of it is being shipped out in tank cars, both to the West and East. All of the caustic is shipped in solution, as the plant does not have fusion facilities. A. T. Newell is in charge of the Stauffer operations, with Dr. H. H. Houtz assisting him.

Of the chlorine consumed on the premises, New York-Ohio Chemical Co. (jointly owned by Stauffer and Harshaw Chemical Co.) uses some in the manufacture of aluminum chloride. This product in turn is being used by two of the other tenants, Montrose Chemical Corp. of California (a joint venture of Stauffer and Montrose Chemical Corp.) and Amecco Chemicals, Inc.

Insecticides and Detergents

Montrose is one of the newest companies to come to Henderson. It has only recently completed installation of complete equipment to make monochlorbenzene and chloral. These products are shipped to the Montrose plant at Torrance, Calif., where they serve as raw materials for DDT manufacture.

Amecco took over the lease of its affiliate company, Hardesty Chemical Co., on the No. 2 magnesium metal unit of BMI on Oct. 1 and has moved its entire operations and headquarters to this location from New York City and Rochester, N. Y. It is producing chlorinated paraffines, chlorinated benzenes, a synthetic detergent of the alkyl aryl sulfonate type, and expects to add other chlorinated organic intermediates as soon as equipment can be installed. The company plans to concentrate primarily on developing its Western markets, according to S. J. Cohen, president. A sales office has recently been set up in Los Angeles, with R. W. Fredericks as sales manager and Dr. E. B. Rubloff as technical director.

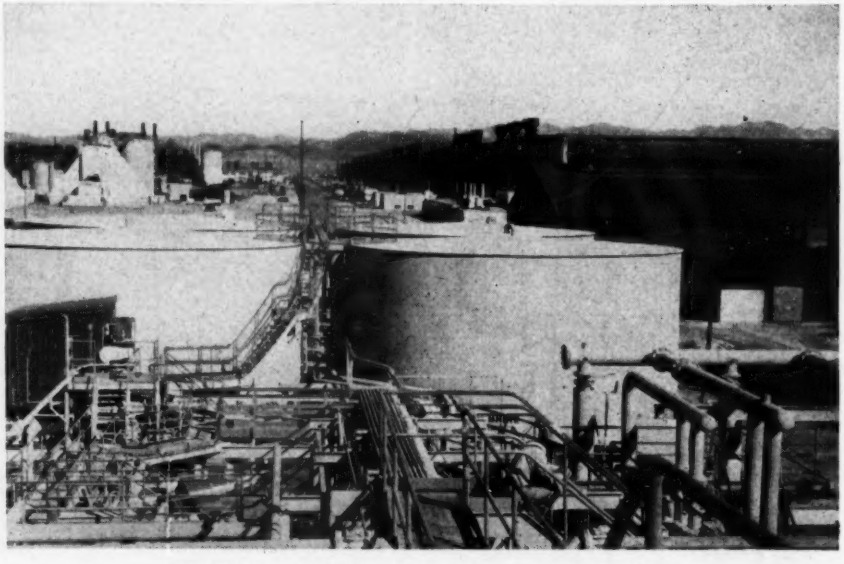
Two other companies which have leased space but are not yet in operation are Mineral Materials Co., which is contemplating putting in milling and sacking facilities for gypsum which it mines nearby, and Valtex Corp., which is planning to make mineral and plastic wall board.

The U. S. Vanadium Corp., which has been making refined tungsten products in one of the magnesium metal buildings, has recently ceased operations. No information is available as to whether the present shutdown is temporary or permanent.

Anhydrous Chlorides

The newest organization to start commercial operation on the BMI premises is Coulter, Harden & Co., which has installed facilities for the manufacture of anhydrous chlorides of Mg, Ca, Ba, and Mn. The company is using a German process which reduces the oxides with dry chlorine gas and suitable reducing agents, forming the anhydrous salts directly and eliminating the usual operation of driving off water. Unusual heat economy is claimed for the process, since it operates on its own heat of reaction after it gets under way.

The two principals of the new partnership, J. Ray Coulter and Bert D. Harden, are former BMI men who formed their own consulting and research organization, Industrial & Metallurgical Engineering Corp., shortly after the magnesium project ceased operation. Coulter, a former chemical engineer with Anaconda Copper Co. and Combined Metals Co. of Salt Lake City, was production superintendent of BMI, while Harden, a mining and metallurgical engineer formerly with Bradley Mining Co. of San Francisco and Chemical Construction Corp., was reduction superintendent. The consulting organization was formed after the two



STAUFFER OF NEVADA: Provides the building blocks.

HARDEN & COULTER: From the dry desert, drier salts.

men had served briefly with U. S. Vanadium as manager and assistant manager respectively.

The new manufacturing company is an outgrowth of work done by the consulting company. At present the operation is carried out using residues purchased from BMI as the raw material for the Mg salt. Calcium oxide is purchased to make the Ca salt. For barium, the company is prepared to surface-mine its own barium sulfate deposits in Clark County, Nevada.

Plans are also being made by the company to manufacture sodium sulfide and zinc sulfate, the latter from zinc concentrates available from Nevada and Arizona. There is a large seasonal demand for zinc sulfate as an ingredient in fertilizers for alkaline soils. As a more distant possibility, the partners are considering the manufacture of barium pigments and perhaps secondary (reclaimed) magnesium. The company is in the process of making arrangements with selling agents. It will offer material for domestic consumption but anticipates that the largest demand for anhydrous salts will be for export because of shipping economies offered by the low water content.

Industry Will Watch

This, then, is a thumbnail sketch of the current status of chemical manufacturing at Henderson. The location offers a favorable climate, long term power and water facilities, a large number of reasonably nearby mineral raw materials, and proximity to the Southern California market. Whether Western chemical consumption will continue large enough to sustain a sizable Nevada chemical industry on a permanent basis remains to be seen. An early straightening out of the power and ownership matters will help. Meanwhile, however, the rest of the industry can be counted upon to keep an interested eye on developments.

GELPROOF JUICE

A pectin-destroying enzyme permits apple juice to be concentrated without jelling, opens up industrial possibilities.

EVERY SUMMER, housewives — and food factories, too—buy tons of pectin to turn fruit juices into jellies and jams. Pectin is a boon to the jelly-maker, but it's a bane to the apple processor in more ways than one.

First of all, he'd like to be able to concentrate his juice to the point (about 70-75 per cent solids) where the sugar content makes it self-preserving; but the juice sets to a gel, because of the pectin, long before that point is reached.

More Eye Appeal

Then too, he'd like to be able to sell a clear apple juice, which would have more eye appeal—and hence more sales appeal—than the characteristically cloudy natural cider. Here again pectin is the culprit: its protective colloid action keeps small pulp particles in suspension. These particles, too small to be filtered, not only mar the appearance but also impair the taste when the juice is pasteurized.

Mild Treatment the Trick

The Old Gold cigarette people have one solution: they destroy the pectin with lime and then acidify. The resulting clear syrup, "apple honey," is excellent for conditioning tobacco; but it would hardly do for cider and jellies for the flavor is destroyed.

The obvious answer is to destroy the pectin—and only the pectin—under conditions so mild that the sensitive chemicals responsible for the flavor are not harmed. As a matter of fact, the juice contains a small quantity of an enzyme which does just that. But its concentration is so low, and its action correspondingly so slow, that the juice spoils before natural clarification is complete.

Now the chemists of Rohm & Haas Co. prepare this enzyme commercially and call it Pectinol A. (There is also a Pectinol W for wines and an M for miscellaneous juices.) The apple processor needs only to add a pound of Pectinol to 100 gallons of cider and let it stand for a few hours at room temperature. The sediment is then removed by decanting or filtering and the cider is ready for pasteurization and bottling. Temperatures over 100° F. inactivate the enzyme in a few minutes, so jellies can be made from the juice simply by restoration of pectin.

Concentrates Are Something New

The use of Pectinol for cider-making is a venerable process, but the swing to concentrates is only now getting under way.

In the past, apple processing has been both seasonal and local—at the time when the apples are ripe and at the place where they are growing. It had to be so, for the juice doesn't keep and it is uneconomical to transport it.

Now the juice can be concentrated without jelling to a 75-per cent-solids syrup which is self-preserving and can be shipped economically. The jelly manufacturer is thus no longer dependent on local, seasonal labor—which may not be available at the critical moment. Also, the jelly maker does not have to cope with varying and undeterminable pectin content in natural juice.

Concentrates are finding a market, too, in mincemeat, and the table syrup field is being explored.

Apple Essence

A by-product of juice concentration, which may prove to be the tail that wags the dog, is apple essence. This is the small but important fraction of the juice which is responsible for flavor and aroma. This fraction, which consists of a mixture of volatile esters and aldehydes, comes off first when juice is evaporated. About a gallon of essence is obtained from 150 gallons of juice.

Paradoxically, only a portion of the essence need be put back to restore full flavor to the concentrate. (The explanation: The essence is so volatile that much of it is ordinarily lost in processing of any kind.) As a result, the surplus essence can be put to other uses. One manufacturer is planning an apple candy; another, an "apple soda" for fountains.

Profits from Off-Grade

All of these new products point the way to profits from surplus and off-grade apples. And Rohm & Haas is actively developing depectinization of other juices so that the advantages of these processes can be brought to the growers of other fruits.

WESTERN INDUSTRIAL Growth Provides Expanding Outlet for CHEMICALS

THE INCREASINGLY IMPORTANT ROLE OF WESTERN INDUSTRY as a consumer of chemicals was emphasized by speakers at the recent Conference on Western Chemical Markets at the Pacific Chemical Exposition. Excerpts from these papers reveal the magnitude of Western needs.

DURING the last decade Americans have been on the move. Many have pulled up their roots and replanted them in Pacific soil, and, more important, the trend is continuing. Industry moves more slowly than population, and for this reason industrial growth has some catching up to do. This adds up to new markets and new ventures for capital as well as prodigious expansion of existing ones.

This was the theme of the Western Chemical Market Research Group's recent symposium at the Pacific Chemical Exposition, where speakers from all phases of Western industry presented a strong case for the West.

CHEMICAL INDUSTRY

The present status of the Western chemical industry was discussed by William J. O'Connell, Jr., of W. J. O'Connell and Associates, and John R. Callaham, Pacific Coast editor of *Chemical Engineering*. They said:

The markets that are, and will be, served best by Western industry spread from Fairbanks, Alaska, to Mazatlan, Mexico, and from Denver, Colorado, to San Francisco, California. The center of concentration of the Western markets is in California, with more than half the population of the eleven Western states. Within the market area there are a multitude of production, manufacturing, processing and servicing operations, principal among these being fruit, vegetable, meat, poultry and fish handling and processing.

Inasmuch as the sources of statistics do not give a true picture of the total volume of chemical process and chemical industry production, either nationally or by sections, it is all but impossible to estimate the percentage of production in the Western states. It has been estimated that as little as 6 per cent and as much as 10 per cent of the national industrial production occurs there.

In the Western states there are markets for chemical sales far in excess of the area's proportion of national population in connection with production and processing of:

Food and kindred products
Paper and allied products
Lumber and timber basic products
Petroleum and products
Rubber and products
Stone, clay and glass and products
Non-ferrous metals

Western chemical industry supplies 90 per cent of the world's needs for borax and more than its share of potash, salt cake, magnesia, wood pulp for processing to rayon, petro-chemicals, and, of course, the fissionable materials.

J. R. Callaham and W. J. O'Connell, Jr.

By and large Western production of sulfuric acid, chlorine, caustic and soda ash is about balanced with the area's present requirements, and it is expected that Western states' production will be kept in line with future requirements resulting from chemical industry expansions.

The producers of basic fertilizer chemicals in the West play a very important part in the total picture of the Western chemical industry, and another very important segment is concerned with the production of halogenated hydrocarbons.

Because wood, pulp and paper are especially important in the Western economy, two papers dealing with those industries will be more fully abstracted next month.

The Western paint and varnish industry supplies about the entire requirements of the local market for its products.

As is always the case, this fastest growing of all United States markets is attractive to new industry to an extent far beyond its size as measured by population. However, there are indications that the rate of population increase is approaching a peak and that the time remaining for new industries to be established under most favorable expanding market situations is limited.

In particular, requirements for sulfuric acid are on the increase as a result of expansions in petroleum refining, new production in detergents and wetting agents, and the expanded operations of the iron and steel industry in the Western states. To a lesser degree increased needs for sulfuric acid are resulting from the expansions of facilities for manufacture of superphosphate, ammonium sulfate, pulp and paper, and in connection with increases in sugar refining, the manufacture of storage batteries and a multitude of electro-plating operations. In addition we can anticipate a future demand to be used in connection with synthetic phenol production, acetylene industry operations and the regeneration of synthetic ion exchange materials. When and if a textile fiber industry is established to serve the growing western garment trade, the needs for sulfuric acid will be markedly increased.

There have been and will be major expansions in glass container manufacture.

Because of limitations in size of the steel industry in the West, there is a serious deficiency of production of benzene, naphthalene and other coal tar crudes. Since, until recently, there was negligible production of benzene, there is no manufacturing of synthetic phenol or aniline. With no naphthalene available there is no phthalic anhydride from that source. Since there is little phenol available there is only a small phenolic resin production and accordingly little demand for formaldehyde. As there is no demand for formaldehyde, obviously no methanol is produced and in the absence of the availability of phenol and aniline the production of dyes, medicinals, flavoring chemicals, photographic chemicals and rubber processing chemicals is insignificant.

Among the organics that are in demand are synthetic detergents, methanol,

newer types of solvents, certain amino compounds (now unavailable from local sources), resins and plastics raw materials, chlorine derivatives, synthetic insecticides and agricultural chemicals, together with coal-tar products and a few medicinals.

Notwithstanding the fact that the West looms large in garment trade importance, there is no rayon industry and hence small need for acetic acid and acetic anhydride. As a corrolary to the limited production of acetic acid, the production of ethyl alcohol is not important.

Not to be overlooked is the availability of protein from cattle and fish. The market for ammonia is growing. Notwithstanding that 60% of the wood pulp used in rayon and cellophane manufacture throughout the United States comes from the Northwest, there are as yet no rayon plants operating in the Western states. The market for chemicals used in treating of wood piling, telephone poles, railroad ties is attractive to manufacturers of the new organics. Some are concerned with visions of further recovery of salts and crops from the sea. It is imperative that the overwhelming importance of the food processing industry in the West be kept in mind. Its operation affects everything from agriculture to the manufacture of glass containers.

This much appears certain: While the Western states have 12% of the population of the nation, the total of all industrial production within those states is but 8% of the national total. As the population of the eleven Western states, and the market area served from these states, moves upward from the present total of about 18,000,000 persons to an estimated population in the year 2000 of 30,000,000 persons, it is inevitable that this discrepancy between the percentage of population of the Western states and the percentage of their manufacturing operations will approach equality. More specifically: Today the West supports 12% of the nation's total population. Within 50 years that figure will rise to 18%; and by that time, it is reasonable to assume, the area will also support 15% or more of the nation's industrial production—or almost double the present 8% proportion.

Probably the biggest advantage that the West has in favor of its development as a chemical industries center is cheap electrical power. Its non-metallic mineral resources bear further exploitation, and there is a sound basis for continued petroleum and gas processing operations.

Nearly half of the entire coal reserves of the nation, in the form of sub-bituminous deposits, are to be found in six of the Western states.

If processing of coal deposits in the West becomes a reality, and assuming that the atomic energy developments are pushed to their logical peaceful ends, the chemical industry of the West should grow to something like 20% or 25% of the nation's total.

In summary, there is every reason to believe that Western chemical industry is a fraction of its proper size, and that the markets it serves are both sufficiently large and can be sufficiently profitable to justify special study of plant locations to serve the Western states' markets.

PETROLEUM INDUSTRY

The magnitude of the market for chemicals afforded by the Western petroleum industry was emphasized by E. H. Weaver, Union Oil Co. of California. He said:

Forty-two and one-quarter to 45 million dollars will be spent during 1947 by the Western petroleum industry for raw and finished chemicals. Based upon present forecasts the industry's consumption for 1948 will be the same or slightly greater.

The Western petroleum industry represents a total investment in the neighborhood of 2½ billion dollars with annual sales running well over one billion dollars.

About 1,030 operators produce 910,000 barrels of crude per day from 23,000 wells for a yearly total of 315,000,000 barrels. This crude is processed by 50 refineries with a total daily throughput of over 900,000 barrels. Seven thousand miles of pipe line with 100 pump stations are used to transport crude from the wells to refineries, marine terminals and tank farms. There are many additional statistics available, but these few should establish the Western petroleum industry as an important industry.

The total figure for chemicals breaks down as follows:

Chemicals for refining and manufacturing	$20,171,000.00
Gasoline & motor oil additives & dyes	12,874,000.00
Field dept., chiefly mud chemicals	7,500,000.00
Specialty chemicals including detergents	1,680,000.00
	$42,225,000.00

The ten most important chemicals used in refining and manufacturing are:

1.	Sulfuric Acid	270,000 tons	$3,636,616.00
2.	Catalyst	14,000 tons	2,500,000.00
3.	Tallow and Fatty Acids		2,400,000.00
4.	Caustic Soda	43,000 tons	2,000,000.00
5.	Filtering Clays	17,000 tons	765,000.00
6.	Phenol	6,500,000 lbs.	750,000.00
7.	Benzol	3,000,000 gals.	500,000.00
8.	Ammonia	2,560,000 lbs.	375,000.00
9.	Methy Ethyl Ketone	3,400,000 lbs.	306,000.00
10.	Sulfur Dioxide	3,242 tons	217,000.00
			$13,449,616.00

Sulfuric acid comes up in top position. Sulfuric acid has many uses in petroleum refining, but the greatest volume is for treating refined oil products, particularly gasoline and kerosene. All sulfuric requirements are supplied by West Coast manufacturers.

The companion to sulfuric acid is liquid caustic soda. Although caustic falls into fourth place in importance in dollar volume, it is considered at this point because of its close relationship to sulfuric. Under normal conditions West Coast manufacturers take care of requirements, but the recent shortage of power in the San Francisco Bay area caused a curtailment in production. As a result some solid caustic had to be shipped in from the East.

Elmer H. Weaver

Second place in cost to the industry goes to catalysts. Nearly all, if not all, of the catalysts are of an aluminum silicate base, activated with sulfuric acid to remove certain impurities. For dehydrogenation and desulfuring operations cobalt and molybdenum are added to provide certain characteristics. Many of the catalytic cracker units started operations with an expensive bead catalyst shipped in from the East, but Pacific Coast manufacturers are rapidly becoming a factor in this field and at this time supply a large portion of the tonnage.

Under the general heading of packing house products are raw tallow, tallow fatty acids, lard oil, oleic and stearic acids, the chief use being in compounding oils and greases. Most of the business is handled by West Coast processors.

Filtering clays are used almost entirely for decolorizing waxes and lubricating oils. Most of this material is obtained on the Pacific Coast at reasonable prices, but small amounts of special clays are shipped in from Eastern points.

Phenol is used in the modern solvent extraction process of manufacturing high grade, solvent refined, lubricating oils.

Benzol is used in processes for the manufacture of a synthetic product which is rapidly becoming a leading product of the petroleum industry.

Ammonia is added to certain crude oils carrying acids injurious to distillation equipment. The ammonia neutralizes these acids, thus reducing corrosion.

Methyl ethyl ketone is used in wax production operations as a miscible solution with the wax bearing oil and as a solvent in the extraction of wax from lubricating distillates.

The principle use of sulfur dioxide is as a solvent to remove gums and impurities in the production of aromatic solvents. It also assists in an operation in the refining of Diesel oil in raising the cetane number.

Phosphoric acid, hydrofluoric acid and litharge complete the list of chemicals of some importance, each of these represent-

ing a total expenditure of between $100,000 to $200,000.

Today the Western petroleum industry spends almost thirteen million dollars per year for chemicals added to its products to improve quality and meet the ever greater demands of automotive engineering. These compounds are known as additives.

The larger share of the expenditure is for chemicals to raise the octane rating and quality of gasoline. The annual expenditure for dyes to give these gasolines and motor oils distinctive colors runs well over the one-hundred thousand dollar mark. In modern motor oils are such additives as corrosion preventives, detergents, pour point depressants, viscosity index improvers, oxidation inhibitors, and antioxidants. The basic chemicals entering into these compounds are legion, but it is reasonably safe to say that chlorine, phenol, phosphorus, napthalene, sulfur, barium, calcium, zinc and alcohols are of prime importance. All, or almost all, of these additives are produced in the East.

According to the conditions found in each well location, there are in use four general types of mud; viz., clay base, starch base, oil emulsion base and oil base. Without going into a long discourse on the merits of the many chemicals used, suffice it to say that operators used starch, limestone, barytes, bentonite, phosphates, quebracho, carbon dioxide, sodium chloride, calcium chloride, calcium hydroxide, methyl carbonate, cellulose, methyl cellulose, chlorinated cellulose and asphalts.

Specialty chemicals account for $1,880,000.00. Water is a major trouble maker, accounting largely for use of specialty chemicals. Most waters contain mineral matter, dissolved gases, bacteria or organic matter, causing scale, corrosion or slime in pipe lines, boilers, cooling equipment and other equipment.

In general, water-treating chemicals include alum, soldium aluminate, silicate, lime, ash, caustic and others. Boiler water treatment utilizes phosphates, tannins, lignins, sodium sulfate, and others. Slime and algae are combatted with chlorine, hypochlorites, phenol derivatives, copper sulfate, bromine, mercurials and others.

Additional problems encountered are dehydration of wet crude oil, dehydration of fuel oil slops, particularly for marine operations, removal of oil from water in field and refinery operations, emulsion prevention in refinery, desalting crude oil, removal of wax, asphalt, bitumen and other deposits from tanks, lines and wells, special additives in doctor-treating and other sulfur removal methods, anti-foamers, removal of mud sheaths from well bores, additives in acidizing oil wells. These require special chemicals.

Detergents are included in the chemical specialties. Their use embraces the cleaning of storage tanks, tanker compartments, tank cars, cleaning and reconditioning drums, as well as a whole catalog of specialized cleaners necessary to maintain good housekeeping.

It is reasonable to expect a future yearly chemical purchase by the Western petroleum industry of $75,000,000 to $80,000,000.

PLASTICS INDUSTRY

The plastics industry of the Western states is supplied in part by Western chemicals, but many of them are "imported." The extent of this outlet for chemicals was outlined by Arthur J. Norton, consulting chemist, and Donald V. Redfern, American-Marietta Co. They said:

In 1947 the west coast plastics industry used directly in its own processing plants 39,814,000 pounds of chemicals for plastic materials production.

Table I: Chemicals Consumed in Western-Made Plastics

Product	*Made in West*	*Used in West (lbs.)*
Phenol, 40°	None	8,064,000
Urea, Tech.	None	500,000
Formaldehyde, 37%	10% of amt. used[1]	13,900,000
Cresylic Acids	Petroleum grades	1,120,000
Caustic Soda[2], 50%	100%	3,780,000
Phthalic Anhydride, C.P.	Almost all	6,800,000
Glycerine, C.P.	None	1,900,000
Maleic Anhydride, C.P.	None	1,000,000
Pentaerythritol, C.P.	None	1,500,000
Solvents[2]	None	500,000
Miscellaneous		750,000
Total		39,814,000

[1] Capacity on west coast for 8,400,000 lbs.
[2] Includes only direct usage—not lacquer or coating solvents
[3] Figures do not include chemicals for protein adhesives

The term *plastics industry* covers, for the purposes of this paper, and conforming to the general practice of today, high polymers except those that are drawn into fibers and the elastomers or rubber-like polymers. Resins for the plywood adhesive industry and for the coating resins are included here in the grand totals of chemicals unless otherwise indicated.

On a breakdown of plastic materials production by classes, it is clear that only the thermosetting phenolic types, ureas, and alkyd resins for coating work are made on the Coast. There is no production of cellulose derivatives, vinyl plastics or other thermoplastics:

Al Hooker and A. J. Norton

Table II: End Use of Plastics on West Coast

Type	*End Use, lbs.*	*Production, lbs.*
Cellulose Esters and Ethers	18,600,000	0
Phenolic Resins		
Molding compounds	18,600,000	250,000
Other Uses	16,000,000	12,000,000
Ureas and Melamines		
Molding powder	5,400,000	None
Other Uses	12,000,000	1,000,000
Polystyrene	7,500,000	None
Other Vinyls	9,000,000	None
Alkyds	20,000,000	10,000,000
	106,500,000	23,250,000

The laminates and composite laminates of wood and paper bid fair to grow rapidly. Various estimates indicate that impregnated paper for the plywood overlay market alone should reach 30 million pounds of phenolic resin per year on the West Coast within five years. These figures sound fantastic until one realizes that in 1935 there was no resin production of any kind on the West Coast and molders used only 300,000 lbs. per year.

At present Western plywood industry obtains about 20% of the phenolic resins and 50% or more of the ureas from Eastern sources.

Except for vinyls, the West consumes in end use products its proportion of plastics, but produces only about one-fourth of its consumption. It now makes plastics for two fields only: plywood and coating.

The trends that are not yet apparent in figures indicate large increases in phenolics for paper impregnation, a rapid increase in polyester usage for low pressure laminating with probable manufacture on the Coast; a large increase in paper and textile treating resins which will be made on the Coast; a large volume for hardboard bonding and most probably the production of cellulose esters and vinyls. It is a fair estimate that in five years the West will be producing all its end use requirements in plastics materials and two or three times that volume in phenolics which will be processed into products for Eastern consumption:

Table III: Chemicals for Plastic Materials in 1953; A West Coast Guesstimate

	Present	*1953*
Phenol	8,064,000	24,000,000
Formaldehyde	13,900,000	38,000,000
Other Aldehydes	.....	4,000,000
Urea	500,000	1,000,000
Cresylic Acids	1,120,000	6,000,000
Acetylene	.....	15,000,000
Cellulose	.....	10,000,000
Phthalic Anhydride	6,800,000	12,000,000
Maleic Anhydride	1,000,000	4,000,000
Solvents	500,000	5,000,000
Pentaerythritol	1,500,000	3,000,000
Caustic Soda 50%	3,780,000	11,340,000
Glycerine	1,900,000	3,000,000
Furanes	.....	5,000,000
Misc.	750,000	1,500,000
Totals	39,814,000	142,840,000

The West Coast plastics industry resolves into two phases from the standpoint of the chemical industry:

1. As a direct consumer of chemicals it is at present very small except in two fields, plywood and coating.

2. Chemicals from wood, petroleum and our other material sources such as pro-

teins coupled with cheap power make the West a large factor in the supply of base chemicals for processing into plastics in other areas.

PAINT, VARNISH AND LACQUER

The protective coatings industry in the West is growing at a faster rate than in older sections of the country. How much faster, its present size, and what it means to the chemical industry were pointed out by Merrill W. Reece and Herbert L. Wampner, of Reichhold Chemicals, Inc. They said:

In 1936, the Western paint and varnish industry consumed approximately 8% of the total amount of chemicals consumed by the protective coating industry nationally. This figure in 1941 rose to 10% and in 1946, to approximately 12%. Total sales in 1941 were 40% greater than in 1936 and in 1946 were 100% greater than in 1936.

Fundamentally, raw materials for protective coatings fall into three general classifications:

Table IV: Materials Classification

I. Pigments
  A. Hiding or Opaque
    1. White
    2. Colored
      a. Inorganic
      b. Organic
  B. Non-hiding or Extender
II. Vehicles (non-volatile)
  A. Oils
  B. Resins
    1. Synthetic
    2. Natural or Fossil
  C. Plasticizers
  D. Cellulose Esters
  E. Protein Binders

Merrill W. Reese

III. Solvents
  A. Petroleum
  B. Coal Tar
  C. Pine product derivatives
  D. Alcohol and derivatives

Table VI shows consumption figures according to the manner in which they are designated in Table IV.

WESTERN AGRICULTURE

Head and shoulders above other Western activities stands agriculture. But Western agriculture is not a representative cross-section of agriculture as a whole: California, for example produces only 1% of the nation's grain, but 46% of its fruits and nuts; and Western farms average 501 acres while the nation's average 162.

The types and amounts of chemicals used in Western agriculture were discussed by Roy J. Hansberry, Shell Oil Co., Inc. He said:

Agriculture in the West is a substantial part of everyone's business. In the Western states one finds almost every crop grown elsewhere and many not grown in other sections.

Roughly 15 million tons of fertilizers were sold last year in the United States. Excluding gypsum, less than a half million tons go to the Western states.

Inorganic arsenicals and fluorine compounds are still big factors in pest control. Although DDT is replacing much lead arsenate in codling moth control, it is still estimated that between 4,000,000 and 10,000,000 pounds of the latter will be used in 1947 in the west. Basic lead arsenate, to the extent of 2,000,000 to 2,500,000 pounds, is used in California, about the only market in the United States. Calcium arsenate, around 5,000,000 pounds, is used principally on tomatoes, vegetables and cotton. Around 5,000,000 pounds of fluorine compounds are used, principally cryolite. DDT consumption in agriculture will probably be 5—10,000,000 pounds for 1947 exclusive of household and barn sprays and mosquito control projects.

Petroleum oils comprise about 2,000,000 gallons of dormant season spray oil and 10,000,000 gallons of foliage or summer oil. Lime-sulphur sales reach 3,000,000 gallons for insecticidal use only. Close to 2,000,000 pounds of HCN and calcium cyanide are used in agricultural fumigations. Minor insecticides are tabulated in Table VII:

Table V: Total Protective Coating Sales

Item	*1936*	*1941*	*1946*
Total Sales	$443,805,971	$622,910,382	$897,115,836
Pacific Coast Sales	35,500,000	62,300,000	107,640,000
Total Production	280,000,000	400,000,000	500,000,000
Pacific Coast Production	22,400,000	40,000,000	60,000,000

Table VI: Chemical Consumption in Protective Coatings

Chemical	*Pounds* 1936	1946
I A1.		
Lead Carbonate (basic)	22,700,000	20,000,000
Lead Sulfate (basic)	1,620,000	2,000,000
Zinc Oxide	6,600,000	6,500,000
Lithopone	14,500,000	28,800,000
Titanium Dioxide	3,700,000	6,500,000
Extended Titanium Pigments	10,800,000	23,000,000
Leaded Zinc Oxide	8,000,000	13,500,000
I A2a.		
Lead Chromate	3,900,000	5,000,000
Zinc Chromate		3,000,000
Hydrated Iron Oxide	6,400,000	12,000,000
Chrome Green	1,000,000	1,500,000
Chromium Oxide	120,000	750,000
Iron Blue	750,000	850,000
Ultramarine Blue	700,000	850,000
Blue Lead	170,000	150,000
Iron Oxide	1,000,000	2,750,000
Red Lead	2,400,000	4,000,000
Litharge	850,000	700,000
Blacks (Lamp & Carbon)	300,000	650,000
Earth Colors (other)	2,700,000	5,400,000
I A2b.		
C.P. Paratoner	100,000	150,000
C.P. Lithol Toner	240,000	360,000
C.P. Toluidine Toner	80,000	120,000
Other Organic Reds	150,000	230,000
Organic Yellows	80,000	120,000
Organic Blues and Violets	120,000	180,000
Organic Greens	16,000	25,000
Coal Tar Lakes (other)	320,000	480,000
I B.		
Talc (Asbestine $H_2Mg_3(SiO_3)_4$)	20,000,000	29,000,000
Barytes ($BaSO_4$)	4,000,000	6,000,000
China Clay ($Al_2O_3.2SiO_2.2H_2O$)	8,000,000	12,000,000
Whiting ($CaCO_3$)	10,000,000	15,000,000
Silica (SiO_2)	4,000,000	6,000,000

	Gallons	
II A.		
Linseed Oil	40,000,000	78,000,000
Soyabean Oil	1,000,000	8,000,000
China Wood Oil	12,000,000	9,000,000
Castor Oil	750,000	6,000,000
Fish Oil	2,000,000	4,000,000
Oiticica Oil	750,000	2,000,000
	Pounds	
II B1.		
Pure Phenolic	1,000,000	3,000,000
Modified Phenolic	7,000,000	13,000,000
Maleic Rosin Modified	1,000,000	2,000,000
Glyceryl Phthalate	8,700,000	23,000,000
Penta Phthalate		2,000,000
Rosin Esters	1,800,000	2,300,000
Urea and Melamine	100,000	1,500,000
Coumarone	150,000	300,000
II B2.		
Rosin	10,100,000	20,000,000
Fossil Gums	2,800,000	2,000,000
Shellac (Dry)	1,500,000	1,500,000
II C.		
Solvent Plasticizers	300,000	200,000
II D.		
Cellulose Derivatives	1,500,000	3,000,000
II E.		
Protein Binders	1,300,000	1,800,000
	Gallons	
III A.		
Mineral Spirits & Thinners (incl. Aromatic Petroleum Hydrocarbons)	10,000,000	30,000,000
III B.		
Coal Tar Solvents	750,000	2,000,000
III C.		
Turpentine	2,000,000	2,000,000
III D.		
Alcohols, Esters, Ketones	1,500,000	4,000,000

Table VII: Minor Insecticide Consumption in the Western States estimated for 1947

Paris green	10,000 lbs.
Tartar emitic	50,000 lbs.
Nicotine alkaloid	400,000 lbs.
Pyrethrum (crop use only)	400,000 lbs.
Cube or derris root	400,000 lbs.
Dinitro insecticide	2,000,000 lbs.
Tar oils	30,000 gallons
Thiocyanates	10,000 lbs.
Methyl bromide	300,000 lbs.

Except for greenhouse use, soil fumigation is fairly new. Probably not more than 30,000 acres are being treated during 1947.

No fungicide figures are available on the Western states alone, except for sulphur, of which from 50,000,000 to 60,000,000 pounds are used in California alone. From various proportions and relations to national consumption the following estimates can be made (Table VIII):

Table VIII: Fungicides Used in Western States

Sulphur dust	70,000,000 lbs.
Lime sulphur fungicide only	1,000,000 gallons
Copper compounds	12,000,000 lbs.
Mercury compounds	18,000 lbs.

More money is spent on weed control than on all other pests. Most of it now goes for labor; but with high labor costs, a great demand for chemicals has arisen.

Main reliance in the past has been on

sodium chlorate and sodium arsenite. Two million pounds of carbon disulphide were used in the West in 1943 for weed control. Petroleum oils are used largely in the West in roadside and non-cultivation programs. Instead of Diesel, fuel and crankcase oil, the tendency now is to use less of special highly aromatic oils which are far more efficient. The addition of toxicants such as sulphur, dinitro compounds and pentachlorophenol to the oil is also expanding. California alone used nearly 10,000,000 pounds of borax in 1945 and 6,500,000 pounds in 1946 for Klamath weed control.

Eight thousand acres of rice were treated with 2,4-dichlorophenoxyacetic acid in 1946 for control of weeds. This probably more than doubled this year. Over 100,000 acres of barley were treated in California during the past winter. It is estimated that more than half the acreage of these two crops will be treated in 1948 in California. This means that in the Western states as many as a million acres of grain may be sprayed using ½ pound of 2,4-D per acre.

In addition to this, around 70,000 acres of grain and flax in California were treated with dinitro compounds for selective weed control. Substantial quantities of ammonium sulphamate and chlorinated benzine are also used.

In addition are literally hundreds of other chemicals used by agriculture for which highly specialized uses have developed.

FOOD INDUSTRY

Preston Lloyd, Director, Stanford Research Institute, Stanford University, elucidated the relationship of the food industry to the chemical industry. He said:

Increasing competition and technological developments have raised food quality standards to a high level. These high production standards have been maintained because of rigorous controls adopted in relation to the selection, handling, and processing of the various agricultural products that go to make up our various processed foods. In the solution of all of these problems relating to food processing, preservation (and this includes storage), and packaging, chemicals play an indispensable role.

A great variety of chemical substances are employed in connection with the production, processing, preservation, and distribution of foods. These include edible acidulants and colors; flavoring and sweetening agents; mineral salts; vitamins for food and feed enrichment; bleaching and aging agents; disinfectants for stables, grains, seeds, soils, and dairy implements; preservatives for foodstuffs; food sanitation and refrigeration chemicals and herbicides; and special miscellaneous chemicals and indicators for quality control.

Edible acidulants, as the name implies, are acids derived from different sources, the use of which is permitted in foods, as adjuncts to flavoring agents employed to enhance or bring out natural or inherent flavors, thereby encouraging the consumer acceptance of foods employing their use. Acids most commonly employed in this category are the organic acids: Citric, tartaric, lactic, acetic (vinegar) and malic. The inorganic acid most commonly used is phosphoric acid.

The next chemical category is that of food flavors. In the broad sense, these compounds are probably the most important items employed because they aid in developing and imparting characteristic

Preston Lloyd

taste to foods and beverages. Of the chemical flavoring materials used, only a few will be mentioned here. The first of these is the sodium salt of glutamic acid. From limited information received from the industry it is estimated that approximately 500,000 lbs. are used annually, valued under prevailing market conditions at about one dollar per pound.

Other synthetic fruit chemical flavoring agents used are as follows:

Fruit Flavor	*Compound*
Pineapple	Ethyl butyrate
Pear	Propyl acetate
Jargonelle pear	Amyl acetate
Apple	Isoamyl isovalerate
Apricots	Isoamyl butyrate plus Isoamyl alcohol
Almond	Benzaldehyde
Strawberry	Ethylacetate plus amyl acetate
Cinnamon	Cinnamic aldehyde
Grape	Methyl anthranilate

In addition to those enumerated above, innumerable essential oils are of significant economic importance to the food industry.

Of aging and bleaching chemicals, three are of particular importance. They are hydrogen peroxide, benzoyl peroxide, and sulphur dioxide. Chlorine is also used as a bleaching agent to a limited extent. Nitrogen trichloride is used in addition to benzoyl peroxide for flour bleaching. Potassium bromate, used to aid in the maturing of bread dough, serves as an annual outlet for about one million pounds of $KBrO_3$.

Certified colors employed in the food and beverage industry may be divided into three groups: Vegetable, mineral, and coal tar. Of the three, coal tar colors are used to a far greater extent than the others. There are eighteen coal tar dyes permissible for use as U. S. Certified colors under the Food, Drug, and Cosmetic Act of 1941.

Sweetening agents, such as sucrose, dextrose, and corn sirup are important ingredients to the food and beverage industry. In the Western segments of the food processing industry it is estimated that there will be used approximately 365 million pounds of the various sweetening agents in 1946 at an estimated cost of approximately $27,000,000.

Under the general category of "food supplements," there is a miscellaneous group of chemicals, the use of which is primarily to enrich foods and feeds.

Emulsifiers and stabilizers form a rather specialized yet heterogeneous group of compounds of interest to this subject. These materials are used as binders or fillers to improve and hold texture. Typical of this group of materials are agar-agar, pectin, lecithin and gelatin.

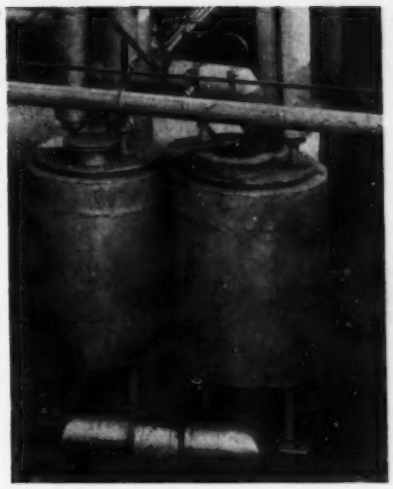
In the field of chemical food preservation, hydrogen peroxide has already been mentioned as a preservative for gelatin against putrefaction and as a protective agent against theromphilic organisms in starch. Probably the most important food preservative as such is sodium benzoate. Salt (NaCl) is also an important food preservative.

The rigid maintenance of cleanliness in food plants in the interest of public health requires the use of large amounts of cleaning compounds, wetting agents and germicides.

Once the food products have been properly processed, consideration must next be given to their packaging. Tin and cellophane are of primary importance. Paraffin wax is used extensively for waterproofing paper, the manufacture of paper milk bottles, paper cups and cartons, closures and hoods for milk bottles and the packaging of bread. It is also used for lining barrels for pickles, vinegar, sirup and frozen fruits. Microcrystalline wax melts at a higher temperature than does paraffin wax and remains flexible at lower temperatures; it is used for waterproofing higher grades of paper and for the manufacture of laminated paper containers for packaging dehydrated and frozen foods. The packaging of such items as meats, peanuts, bakery products, potato chips and shortening requires grease-proofed paper. The protein zein is used for this purpose.

Last, but not least, resins and plastics are important as paper impregnators, can lacquers, and for can, bottle and glass closures. Ureaformaldehyde resin is used for making special laminated boxes; melamine resins are used to impart a high wet strength to impregnated packaging paper; various types of special resinous lacquers are used for coating food cans; the vinyl resins among others are used for coating beer cans.

PHOSGENATION Products Range From Resins to Grass Killers



EDITORIAL STAFF REPORT

PHOSGENE-DERIVED CHEMICALS promise to provide a host of new and unique products: plastics, plasticizers, grass killers, lubricants for compounding synthetic rubber, solvents and polymerization catalysts.

TO MOST people the mention of phosgene brings to mind its use in World War I as a war gas; deadly, inexpensive, and capable of ready production on a large tonnage basis in relatively simple equipment. This combination of potential low cost and ready production, when added to its great chemical reactivity, provide the three major incentives which have led to the utilization of phosgene as a chemical intermediate by the Columbia Chemical Division of the Pittsburgh Plate Glass Co. at Barberton, Ohio. This use has resulted in the development of a broad line of hitherto little-known and unique intermediates: carbonate esters, chloroformate esters, and carbamates.

HOW IT STARTED

Columbia's interest in the use of phosgene dates from 1938 when the laboratory work was initiated which led to the development of the first Allymer (CR-39) about 1941. CR-39 is produced by the polymerization of allyl diglycol carbonate, $(CH_2 = CHCH_2OCOOCH_2CH_2)_2O$ a product which is formed by the reaction of allyl alcohol and diethylene glycol with phosgene. It was developed primarily for use as a clear glazing resin and can be cast into sheets, rods, and tubes. These shapes can be fabricated into a variety of forms but because of its thermosetting qualities most products are difficult to produce except by the use of casting techniques.

THE POLYMER

The product of polymerization of CR-39 monomer is intermediate between glass and other clear plastics in its properties. It is much more resistant to abrasion, heat and solvents than other transparent plastics, while it retains the lightness and resistance to impact.

CR-39 monomer was the first material utilized in the low-pressure lamination and impregnation of such materials as wood veneer, cotton fabric, glass fabric and other fibrous fillers. However, because of its long curing time it has since been generally superseded by the alkyd type of materials for this use. Most of the monomer which is sold at the present time is utilized as a casting resin.

The CR-39 Allymer is now being sold as only a monomer by Columbia and no division of Pittsburgh Plate is now producing the cast material. The polymerization has been left for the resin manufacturers to carry out.

PHOSGENE

The phosgene required for the phosgenation reactions is produced by the standard process, developed during World War I, that is, by the catalytic combination of carbon monoxide and chlorine in the presence of an activated carbon catalyst. The required carbon monoxide is produced by the combustion of a high purity petroleum coke with pure oxygen, introducing carbon dioxide along with the oxygen in sufficient quantity to control the temperature. Excess carbon dioxide is removed by an alkali wash and the resultant carbon monoxide is mixed with chlorine before entering the phosgene converters which are packed with the catalyst—activated carbon. A slight excess of carbon monoxide is used and the yields are almost quantitative. The product coming from the converters is used without further purification for most reactions. Columbia does not plan to market phosgene, as such.

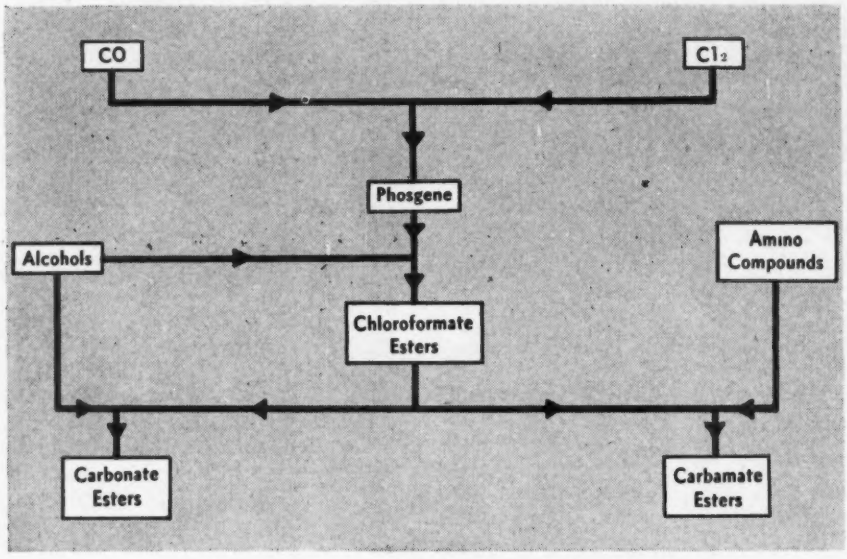
CHLOROFORMATES

Although the first end-product desired was the carbonate ester of diethylene glycol and allyl alcohol, the first production problem which had to be solved was that of the formation of diglycol chloroformate. The desired allyl alcohol ester is formed by the reaction of the diglycol chloroformate with allyl alcohol. The same procedure is utilized in the preparation of practically all other phosgenation products, that is, the chloroformate is first formed, serves as the intermediate in the production of the final product. In the manufacture of the chloroformates no alkali is used in the reaction vessel to absorb the hydrogen chloride which is liberated by the reaction:

$$2COCl_2 + HO(CH_2)_2O(CH_2)_2OH \rightarrow 2HCl + ClCO(CH_2)_2O(CH_2)_2COCl$$

There is essentially no production of the organic carbonates or chlorides which might be formed by the reaction. The effluent gas from the reaction, before passing through the burner, is principally hydrogen chloride with small quantities of phosgene and non-condensibles. Before the non-condensibles are exhausted to the atmosphere the hydrogen chloride is removed by a water wash. An alkali wash

Burners and scrubbers for removal of the last traces of phosgene and hydrogen chloride from the non-condensibles remaining after the phosgenation reaction.



using the effluent liquor from the tower in which the carbon dioxide is removed from the carbon monoxide charging stock is utilized to prevent hydrogen chloride or any final traces of phosgene from exhausting into the atmosphere.

In addition to the diglycol chloroformate, isopropyl chloroformate, methyl chloroformate, ethylene glycol chloroformate, and several of the polyglycol chloroformates are being produced.

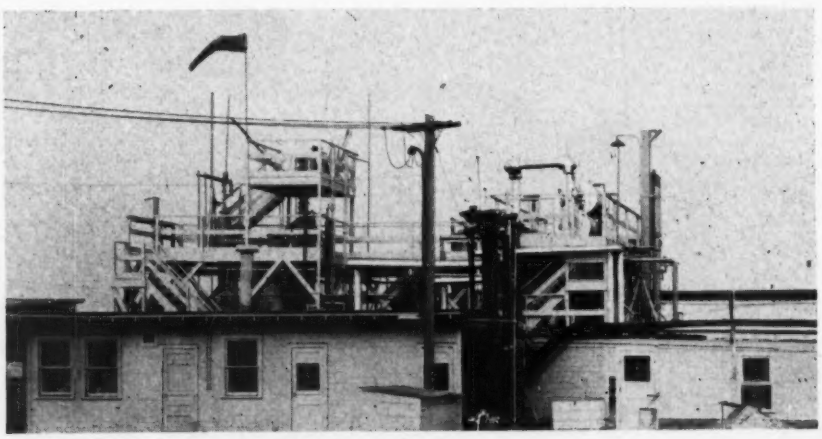
CARBONATE ESTERS

It was for the production of carbonate esters that Columbia's work on phosgenation was started, the esters being formed by the reaction of the chloroformate with a hydroxy compound. In contrast to the procedure adopted for the production of the chloroformate, carbonate production is carried out in the presence of an alkali, which is present primarily to absorb the hydrogen chloride released during the course of the reaction. The carbonate esters which are being produced range from the polysyllabic monomer of the CR-39 Allymer, diethylene glycol bis allyl carbonate, to the simplest possible member of the homologous series, dimethyl carbonate, $(CH_3O)_2CO$. This latter product is a good low-boiling solvent for many resins and may itself find a use as a synthesis intermediate. Allyl diglycol carbonate, in addition to its use as the monomer for the CR-39 Allymer, is also showing some promise as a modifying agent for various ethylenic polymers when it is used as a copolymer material.

At the present time the principal use for the phosgene-derived carbonate esters is in the preparation of plasticizers. Butoxy ethyl diglycol carbonate, $(CH_2(CH_2)_3O-(CH_2)_2OCOO(CH_2)_2)_2O$, shows excellent efficiency when used as a plasticizer for polyvinyl chloride and it is competitive with dioctyl phthalate on a price basis. This ester also shows promise as a lubricant to prevent non-carbon black reinforced butyl rubber stocks from sticking to the mill rolls during compounding. The material is particularly useful with butyl stocks reinforced with Silene EF, a precipitated calcium silicate.

The ortho-free cresyl carbonate ester of diethylene glycol, $(CH_3C_6H_4OCOO-(CH_2)_2)_2O$, appears to be a useful plasticizer for vinyl flooring and tiling. It is higher boiling than dioctyl phthalate and thus more permanent, and it is competitive in cost. There is also some reason to believe that it gives a tiling with an improved resistance to abrasion. The cresyl ester appears to be an excellent vinyl plasticizer where permanence is of prime importance.

Other esters which have been prepared are butyl diglycol carbonate and phenyl diglycol carbonate.



General view of the phosgenation plant of the Columbia Chemical Division of the Pittsburgh Plate Glass Company at Barberton, Ohio.

CARBAMATES

Several carbamates have been produced which show promise. However, at the present time, it appears that the first large scale demand will be generated if isopropyl N-phenyl carbamate, $C_6H_5NH-COOCH(CH_3)_2$, is accepted as a satisfactory agent for destroying certain narrow leaf grasses, such as quack grass. Sufficient data to enable a decision on the suitability of this product is expected some time around the first of the year.

IPC

The first step in the production of IPC, which to a certain extent might be said to occupy the same place in relation to narrow leaf plants that 2,4-D occupies in relation to the broad-leaf plants (C. I., Aug. '47, pg. 212), involves the production of isopropyl chloroformate from phosgene and isopropanol. Reaction of the chloroformate with aniline gives the desired isopropyl N-phenyl carbamate.

However, IPC is not the only potentially valuable carbamate derivative. For example, diethylene glycol dicarbamate, $(H_2NCOO(CH_2)_2)_2O$, produced by the reaction of ammonia with diethylene glycol chloroformate, is under active investigation as a modifying or co-condensing agent for use in the production of urea-, melamine-, and phenol-formaldehyde resins. Diglycol carbamate will also condense with formaldehyde by itself to produce tough colorless resins with flexural strength values as high as 22,000 psi. Some of the organic carbamates are also being evaluated for possible use as plasticizers for polyvinyl chloride.

PEROXIDES

Another interesting group of phosgene derivatives is represented by isopropyl peroxydicarbonate, which has interesting properties as a catalyst for ethylenic polymerizations. However, the hazardous nature of this member of the series does not promise any widespread use at present.

PRESENT STATUS

The phosgene derivatives, as yet, are not in mass production but they do represent a series of interesting and potentially inexpensive chemicals which appear to be on the verge of developing mass markets for several uses.

The Changing Picture of INTERNATIONAL CHEMICAL TRADE

by C. C. CONCANNON, Chief
Chemical and Drug Division, Office of International Trade
U. S. Department of Commerce, Washington, D. C.

CONTINUING HIS DISCUSSION OF CHEMICAL PRODUCTION, begun last month (C. I., Oct. '47, pg. 614) with a survey of United States chemical production, the author here discusses briefly both the production in other parts of the world and the world export-import picture.

WITH three quarters of 1947 over and the lapse of two full years since V-J Day, another pattern of world chemical trade is taking form. It will doubtless be highlighted by keener competition in world markets on the part of outstanding chemical manufacturers of the United States, United Kingdom, France, Netherlands, Sweden, and Switzerland. The German industry, although disrupted at the termination of hostilities, shows signs of improving its position in international trade.

RELATIVE RANK

During the war years, world production and consumption of chemicals and allied products reached heights undreamed of before 1939. The United States is the world's largest producer, exporter, and importer of chemicals. Now second, the United Kingdom holds the place which belonged to Germany in the years immediately preceding the war. In 1939 France ranked fourth and today probably belongs among the first five, being possibly the third largest. Switzerland, Sweden, Spain, and Italy—in fact, most European nations—were important manufacturers of chemical products in 1939. As neutrals, the first three were able to increase their output during the war and in the future will compete for a larger share of chemical foreign trade.

The relative position of the major producing and consuming countries remained unchanged throughout the 10 years 1929-38. Foreign trade in chemicals and allied products indicated a considerable gain in 1938 compared with 1934, when the world was recovering from the 1932-33 depression. Table I shows foreign trade of principal countries in chemicals and allied products in 1934 and 1938.

During the first 6 months of 1947 United States exports of chemicals and allied products rose in value to $437,000,000, as shown in Table II, a figure more than twice that for the entire year 1939. If this high rate continues in the second half of the year, 1947 exports will be well above the peak figures attained in the war years.

In the first 6 months of 1947 imports of chemicals were valued at almost $190,000,000, compared with $143,000,000 in 12 months of 1939. Europe has not only customarily been the largest consuming area for our chemical products, but also, prior to 1940, was an important source for our imports. Canada has long been an outstanding supplier of United States imports and in 1946 was the largest single source. South America as a group accounted for 35 per cent of the total, North America for 29 per cent, Asia for 19 per cent, Europe for 10 per cent, Africa for 6 per cent, and Oceania for 1 per cent.

THE BALKANS

In the Balkan group, Bulgaria, Greece, Rumania, and Turkey are predominantly agricultural, although the Greek and Rumanian chemical industries have progressed. In 1939 chemical manufacture in Greece reached a peak output of $20,000,000. Present production is retarded by the uncertain political outlook, the shortage of materials, and speculation with existing stocks. Increased importance is indicated for the Rumanian industry, which had 233 factories in 1938. Nitrogen, which belongs to the Mica group, Marasesti, Uzinele Solvay, and Phoenix were important, well-established prewar firms. Until the exchange situation and other factors are altered, however, Rumanian chemical trade will probably be mostly on a barter basis. Turkey's decision in 1944 to release its economy from long-established ties with Germany had a drastic effect on the country's chemical trade.

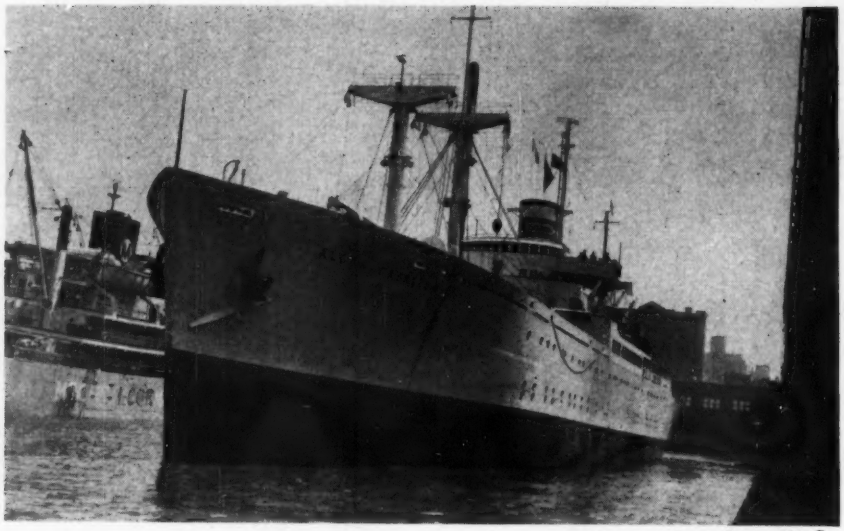
Belgium, one of the leading manufacturing countries in Europe, kept intact, to a great extent, its general industrial organization and thus recovered more rapidly than some countries from the effects of occupation. Operations by Union Chimique Belge, the leading concern, have been irregular because of shortages of materials and fuel. Produits Chimiques de Tessenderloo resumed operations in three departments in 1943 and by 1946 had restored many parts of the organization to full working order.

Although the Czechoslovak chemical industry faced shortages of raw materials and labor, and transportation and equipment problems, nevertheless, by the end of 1946 Czechoslovakia possessed one of the most diversified and potentially efficient industrial structures in Europe. Under the Two Year Plan, the chemical group will receive $70,000,000 of the $430,000,000 in capital investments to be allotted to industry in 1947-48. The nationalized chemical group comprises more than 100 factories, organized into 10 corporations, with profits in 1946 of approximately $25,000,000. The huge Stalin

TABLE I

FOREIGN TRADE OF PRINCIPAL COUNTRIES IN CHEMICALS AND ALLIED PRODUCTS

Country	*Imports*		*Exports*	
	1934	*1938*	*1934*	*1938*
Belgium	$45,900,000	$48,400,000	$57,700,000	$62,200,000
Denmark	20,900,000	26,600,000	3,200,000	3,900,000
France	76,400,000	64,500,000	111,900,000	90,600,000
Germany	100,500,000	84,200,000	251,500,000	263,300,000
Italy	40,700,000	29,500,000	23,700,000	29,700,000
Netherlands	55,000,000	55,000,000	46,000,000	48,600,000
Poland and Danzig	9,900,000	14,200,000	5,200,000	6,100,000
Switzerland	26,400,000	24,500,000	40,400,000	40,700,000
United Kingdom	105,000,000	117,300,000	123,400,000	131,700,000
Japan	42,600,000	46,100,000	28,800,000	34,800,000
Canada	34,500,000	38,400,000	15,300,000	20,500,000
United States	96,500,000	123,500,000	132,600,000	157,600,000



Courtesy Alcoa Steamship Co.

The value of chemicals exported during the first six months of 1947 was $437,000,000.

Synthetic Gasoline Works at Most is undoubtedly the largest enterprise.

FRANCE

No major destruction occurred in France's highly developed, modern chemical industry, which manufactures a wide range of products. After Liberation the industry's most important tasks were rehabilitation of domestic manufacture and resumption of a competitive position as an exporter. Output of chemicals improved in 1945 but was far below prewar rates. Operations in 1946 were spotty, and production was probably little more than half that in 1938. The fertilizer industry made good progress in 1946. The organic group depends largely upon supplies of raw materials from coal distillation and provision of additional facilities has been recommended by the Ministry of Industrial Production. Paint output cannot meet the mounting demand from repair and construction needs. Plastics manufacture has grown rapidly. Strenuous efforts were made to increase production of chemicals for pharmaceuticals, one of France's large exporting industries. The highly important perfume branch reached a prewar volume of approximately $30,000,000, with exports valued at $10,000,000. At the end of hostilities stocks of perfume materials were exhausted and most essentials were lacking. Replenishment has been hampered by difficulties, but essences are being extracted in the Grasse region.

TABLE II

UNITED STATES EXPORTS OF CHEMICALS AND ALLIED PRODUCTS, BY AREAS AND PRINCIPAL COUNTRIES

(Thousands of dollars)

Areas and Principal Countries	*1939*	*1940*	*1945*	*1946*	*Jan.-June 1947*[1]
Europe	$63,534	$78,528	$151,653	$157,620	$124,583
Belgium	4,165	859	2,747	11,362	9,319
Czechoslovakia	121	...	2,736	4,190	3,221
Denmark	777	162	113	1,462	811
Eire	179	178	303	1,226	971
Finland	635	1,378	20	1,460	879
France	6,054	6,596	9,653	28,977	21,503
Greece	568	180	1,979	5,381	2,685
Italy	1,698	2,093	5,667	9,823	6,485
Netherlands	4,287	925	3,437	7,845	10,059
Norway	2,008	630	963	3,297	2,968
Poland	417	...	3,615	3,783	2,891
Portugal	408	1,651	2,887	3,482	2,333
Spain	732	732	1,858	3,429	2,781
Sweden	5,464	2,357	6,904	15,836	14,501
Switzerland	961	1,546	4,063	12,793	8,107
United Kingdom	29,708	58,646	35,712	34,387	29,391
U.S.S.R.	214	45	65,162	3,495	1,555
Yugoslavia	129	119	3,208	3,071	1,390
North America	57,503	71,420	154,675	176,598	118,812
Canada	34,612	43,946	77,630	92,142	60,644
South America	25,747	36,845	71,889	102,266	79,055
Asia	35,888	48,205	51,452	102,139	87,356
India	5,317	11,549	31,333	20,052	27,773
Oceania	8,952	10,113	11,442	12,967	11,895
Australia	7,357	7,618	8,220	9,624	8,590
New Zealand	1,550	2,458	3,000	3,153	3,211
Africa	6,224	10,850	22,509	22,249	15,569
Union of South Africa	4,010	7,123	9,569	12,152	9,899
Total of all countries	$197,849	$255,962	$463,620	$573,837	$437,265

[1] Preliminary data.

Source: Compiled in the Chemical and Drug Division from data supplied by the Bureau of the Census, U. S. Department of Commerce.

Spring recovery of industrial production in the United States Zone of Germany was halted abruptly by the coal shortage. The decline in chemicals was sharpest; output dropped from 53 per cent of the 1936 rate in May to 45 per cent in June. In 1936 the Combined Area (United States and British Zones) accounted for more than half the total industrial production of Germany and approximately half of the chemical industry, but until regular, adequate supplies of coal are available, no sustained improvement in chemical production is possible. The latest plan will retain approximately the 1936 capacity in the chemical industry or 42 per cent more than under previous proposals. In the basic organic and inorganic branches, it is planned to maintain facilities sufficient to permit prewar levels.

Hungary's chemical industry is important to the country's recovery efforts. The Three Year Economic Plan would raise production to 142 per cent of the prewar figure. In 1946, the chemical industry was the only industrial group to exceed 1938 levels in both capacity and production. The important Peti Nitrogen Works plans to reconstruct and enlarge its plants.

ITALY

Damage to chemical plants in Italy was apparently less severe than might have been expected. Chemical production has been retarded more by lack of materials than by destruction of facilities. Operations in 1945 probably did not exceed 20 per cent of prewar volume but have now risen to between 40 and 75 per cent. Montecatini (Societa Generale per l'Industria Mineraria e Chimica, Montecatini) dominates the Italian chemical industry. By September, 1946, the company had restored 110 of its 156 plants and given employment to 47,000 of 57,000 prewar employees. By mid-1946 Montecatini's production had reached 70 per cent of prewar, but later in the year declined to 45 per cent for chemicals. In March, 1947, it reached 65 per cent of the 1938 average monthly production index.

When war came in Europe, the chemical industry of the Netherlands had attained a high degree of development, though lacking domestic raw materials and power. The greatest damage occurred in the nitrogen industry and was most severe at the Sluiskil plant of the Netherlands Nitrogen Co., which accounted for almost a third of total capacity. Despite the necessity of re-equipping a plundered, worn, and, in some cases, obsolete industrial machine, exports of chemicals and related products reached $10,000,000 in 1946. In the long-range plans of the Netherlands Government for industrial development, the chemical group is receiving special consideration.

Less destruction befell the chemical in-

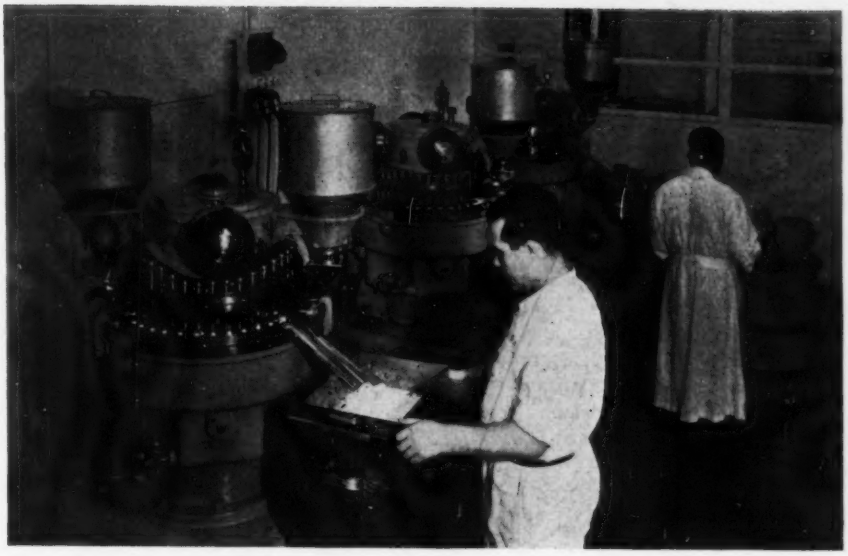
dustry in Poland than was expected, but it is not yet known to what extent the change in boundaries will affect output. Plans call for much greater industrialization and the country as a whole may be said to be better equipped for chemical manufacture. The territory ceded to the U. S. S. R. is principally agricultural, but that annexed in the West is mostly industrial and contains the important city of Breslau. During the occupation the chemical group was drastically rationalized. Of 992 chemical plants in operation in 1938, the largest was the Government-owned United Explosive and Nitrogen Works of Moscice-Chorzow, and next was the Polish Solvay Works, Ltd., Warsaw.

U. S. S. R.

When important centers of production in the western provinces of the U. S. S. R. were destroyed or damaged, nitrogen capacity was reduced 50 per cent, sulfuric acid 77 per cent, soda ash 83 per cent, and dyes 88 per cent, according to official Soviet reports. These losses stimulated a large-scale program of construction and expansion, particularly in the Urals and in the central region near Moscow. Manufacture of synthetic ammonia, sulfuric and nitric acids, superphosphates, ammonium phosphate, ammonium nitrate, sodium nitrate, calcium carbide, cyanamide, paint, fertilizers, and plastics was expanded. The chemical industry looms large in future economic plans. So great is the importance attached to fertilizer production that half of the total capital allotted to chemicals has been earmarked for the restoration and construction of fertilizer plants. Plans call for increases over prewar levels of 100 per cent in superphosphates, 80 per cent in nitrates, and 30 per cent in potassic fertilizers. The aniline dye, caustic soda, calcined soda, and pharmaceutical branches will also be extended.

Spain's position in World War II was favorable for the building of an important chemical industry and the manufacture of chemicals and pharmaceuticals expanded rapidly, particularly in the absence of foreign competition and as a result of favorable prices and the Government's efforts to stimulate production. Many new plants have been erected or are being built; some, although completed, lack machinery and raw materials. Establishments under control of the National Syndicate of Chemical Industries had an annual output value of $50,000,000. Production in 1946 was undoubtedly up considerably, and foreign chemical trade likewise improved.

The war years offered the Swedish chemical industry an opportunity to expand along a variety of lines and its production now probably exceeds the annual prewar volume of around $75,000,000. Lacking coal and salt, Sweden has utilized its vast forest resources in the production of a considerable range of chemical products. In addition to the erection of many new plants, extensive research facilities have been provided and more are planned. A significant wartime development is the greater participation of the internationally important munitions concern, Bofors A.B., in the field of peacetime chemical production. Mo och Domsjo A.B. has developed a sizable and versatile chemical industry based on cellulose byproducts. Stockholm Superfosfat Fabriks A.B., a large producer of nitrogenous fertilizers, expanded its output substantially, and industrial chemicals were manufactured in greater quantities during the war by leading concerns in that field—Reymersholm Company of Halsinborg, Stockholm Superphosphate Company, Swedish Saltpeter Works, Electrokemiska Company of Bohus, and the Gerrolegeringar Company. The pharmaceutical branch grew notably and prospects seem sound for an industry based on organic aliphatic materials.



"United States imports of chemicals from South America in 1946 were larger than from any other region." Pharmaceutical plant of the Sydney Ross Co. at Buenos Aires, Argentina.

SWITZERLAND

Switzerland, especially important in the fields of dye and pharmaceutical manufacture, as a neutral continued to carry on foreign trade with all countries. The chemical industry emerged from the war period in good condition on the whole. Swiss manufacturers have concentrated on supplying the domestic market and on research. They have also been keenly in-

TABLE III

UNITED STATES IMPORTS OF CHEMICALS AND ALLIED PRODUCTS BY AREAS AND PRINCIPAL COUNTRIES, 1939-1946

(thousand of dollars)

Area and Principal Countries	*1939*	*1940*	*1945*	*1946*	*Six months 1947*
Europe	56,564	$29,321	$24,133	$30,042	$17,993
Belgium	6,641	1,902	154	2,389	1,615
Bulgaria	348	246	765	689	178
Czechoslovakia	65	*		64	33
Denmark	110	46	2	82	83
France	6,566	6,623	4,200	7,692	3,453
Greece	307	118	*	191	4
Hungary	224	249		11	23
Italy	2,442	1,603	1,755	3,181	936
Netherlands	4,621	1,515	285	960	2,273
Norway	2,536	534	3	441	216
Portugal	274	850	981	941	216
Spain	1,109	2,863	3,590	2,142	600
Sweden	351	134	61	217	180
Switzerland	6,149	2,902	2,793	4,422	2,293
United Kingdom	5,819	6,313	8,017	5,201	5,121
U.S.S.R.	1,675	640	1,231	290	334
Yugoslavia	611	142		194	60
North America	20,893	21,592	119,475	85,644	49,694
Canada	1,360	13,629	84,124	37,603	20,197
South America	27,774	33,815	79,744	103,538	72,337
Asia	33,269	48,149	21,274	56,977	53,546
India	4,952	7,639	13,064	26,758	14,670
Oceania	345	451	786	2,422	1,047
Australia	196	294	594	2,110	794
New Zealand	140	115	184	298	231
Africa	4,147	5,655	16,268	16,968	7,366
Union of South Africa	238	184	1,875	2,030	1,383
Total, All Countries	$143,004	$139,002	$261,681	$295,592	$201,982

* Less than 500 dollars.

terested in the development of new products, especially pharmaceuticals, textile chemicals, and agents for plant protection. Both Swiss factories and the majority of their foreign plants worked at capacity in 1946. Switzerland ranked among the first ten in world chemical trade in the prewar period and probably moved up among the first five in 1946. Exports of three major groups—pharmaceutical and medicinial preparations, industrial chemicals, and dyes and colors—were valued at $94,000,000 in 1946, almost double the 1945 figure and considerably above those in prewar years. Swiss chemical manufacturers undoubtedly benefited from the absence of German competition.

UNITED KINGDOM

In the United Kingdom and British Empire overseas areas, Imperial Chemical Industries, Ltd., continues to be the dominant factor. Aggressive competition in all world markets, the expenditure of large amounts on research, and an extensive program of expansion feature its policies. Empire countries continued to be leading customers for the United Kingdom's chemical products. India retains its place as the chief purchaser, taking £4,412,000 worth in the first 6 months of 1947.

The United Kingdom ranked third in 1938 as a world manufacturer of chemicals and allied products. Damage to manufacturing facilities was relatively low, but reconversion has been hampered by shortages of materials, delay in receiving equipment needed for expansion projects, and, particularly since the latter part of 1946, by the lack of coal. However, despite these adverse factors, output in 1946 was comparatively large. Priority has been given to production for export at the expense of the domestic market. Export targets for chemicals and related products have been fixed at a monthly rate of £6.85 million by mid-1948 and £7.5 million by the end of 1948, increases of 88 and 106 percent, respectively, over 1938.

By 1943 the chemical industry ranked seventh among manufacturing groups in Canada and it has grown from 808 plants in 1939 to 968 in 1946. Gross value of production (including explosives and war materials) reached a high of $765,000,000 in 1943, 380 percent above 1938 levels. Preliminary figures place 1946 output at $356,000,000 (excluding explosives and war materials). Production has dropped slightly from 1944-45 totals but is more than double the rate in 1939, the best prewar year.

In 1939 United States chemical interests controlled 220 companies and had an investment of $117,000,000, or 68 percent of the industry's total investment.. Canadian Industries, Ltd., operates 27 plants and does approximately half the chemical business in the Dominion. During the war it organized Defense Industries, Limited, as a wholly-owned subsidiary and operated it for the Government. This enterprise has been liquidated. Normally, Canada is a larger importer of chemicals than an exporter. In the war years this relationship was altered, but 1946 figures indicate a return to the prewar position. The United States is both Canada's leading supplier of chemical products and its best customer for them.

The shortage of imported chemicals and lack of shipping facilities, as well as a keen interest in becoming a postwar competitor, led to a considerable development of the South African chemical industry in the war years. In the period 1939-44, gross output more than doubled, reaching about $115,000,000 in the fiscal year 1943-44. However, manufacture is still somewhat dependent on supplies from abroad—imports of chemicals and allied products were worth $25,000,000 in 1945. African Explosives and Chemical Industries, Ltd., dominates the field. It is affiliated with Imperial Chemical Industries, Ltd., and plans to spend about £3,000,000 on expansion and new projects. New plants have also been established by other firms.

"Preliminary figures place 1946 output at $356,000,000 (excluding explosives and war materials)" in Canada. Plants of Shawinigan Chemicals Ltd. at Shawinigan Falls, Quebec.

CHINA

All phases of the chemical industry have been affected by the present turbulent conditions in China to a greater extent perhaps than any other commodity group. Activity stands at a low level compared to 1939 and the chemical market was highly erratic in 1946. These conditions have their roots not only in the aftermath of a long war but in the drastic changes that are occurring in the national economy. However, efforts are being made to reestablish the chemical industry.

Japan no longer holds a place among the first 10 producers of chemicals. In 1946 the production index (1930-34 equals 100) averaged only 36.9 and in 1945, 36.6. Under the Ministry of Commerce and Industry, a Chemical Industrial Technical Committee has been organized to plan the reconstruction and modernization of the industry. During the war years chemical production was held at fairly constant levels until April 1944, when the shortage of supplies and labor and failure of plant maintenance brought a marked decline. As a significant factor in raising food production, the fertilizer industry is now receiving special attention.

The manufacture of alcohol has expanded greatly in Cuba, but otherwise there have been no outstanding changes in the chemical market since the outbreak of war.

Mexico continues to import approximately two-thirds of its chemical requirements despite rather rapid progress in domestic manufacture. Chemicals are said to be made in more than 100 factories established since 1942 and the value of production in 1945 was estimated to be 10 times greater than in 1940. In prewar years Germany dominated the Mexican market, but the United States has now become the principal supplier.

SOUTH AMERICA

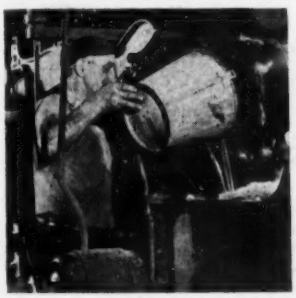
The chemical industry has made considerable progress in South America in recent years, particularly in Argentina, Brazil, Chile, Peru, and Uruguay. South American Republics have been particularly active in exploiting their natural resources. The Chilean nitrate industry, for example, gained new importance during the war. Production of argols and tartrates in Argentina was a wartime development. United States imports of chemicals from South America in 1946 were larger than from any other region.

A CI REPORT ON

SYNTHETIC DETERGENTS

Main Types, Uses, Properties and Prospects

by JOHN W. McCUTCHEON*



WHEN ANY BUSINESS GROWS AS RAPIDLY as has the manufacture of synthetic detergents a good deal of confusion is bound to result. With dozens of new compounds being introduced monthly, detergent makers find it difficult to keep posted on competitive products, detergent consumers are at a loss to know which material is best suited for any particular job. Here, brought up to date, is a tabulation of the properties of more than 400 commercial compounds together with a discussion of the industry's present status and long-range prospects.

AS RECENTLY as the early '30's production of synthetic detergents was insignificant; there were few manufacturers of these surface-active agents and a mere handful of consumers. But within the past 15 years a huge industry has grown up, an industry which is now turning out some 600 million pounds of detergents and other surface-active agents annually and whose products are finding a multitude of uses. Nor is the end of this phenomenal growth in sight. New plants are being built, existing units are being expanded, new uses are being found for synthetic detergents, new markets are being cultivated.

Why this enormous increase in output? What inroads will the newer compounds make into established soap markets? Which type of detergent best performs any particular function? What is the chemical nature of the competitive products? These are a few of the questions which perplex both detergent makers and detergent consumers, the answers to which can be gained only by considering a chronological review of developments, a careful differentiation of the terminology, and a comparative study of the main products on the market.

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For several thousand years soap has had a monopoly of the cleaning business. And it has proved to be a worthy monopolist. It is a good, inexpensive detergent. Nevertheless, soap does not provide the answer to all cleaning problems. It functions well in warm, soft, alkaline water, but like all surface-active agents it has its limitations.

Many industrial processes in which cleansing is performed are more conveniently or efficiently carried out in acid solution, or in the presence of strong electrolytes or metallic ions. Under such conditions soap is unsuitable. Also in hard-water areas the use of soap is uneconomical. The desire to overcome these deficiencies in the textile field spurred the search for other surface-active agents which would perform well in cold, hard, or salt-carrying waters.

HOW THE BUSINESS ORIGINATED

About 1930 a significant discovery was made. Research chemists observed, in Germany, that the sodium salts of the higher alcohol sulfates had properties similar to those of soap. They compared well as far as detergency, wetting and foaming power were concerned, and their calcium and magnesium salts were water-soluble, did not precipitate from water of extreme hardness.

Early in the 1930's these German-made sodium salts were introduced to the American market by the Gardinol Corp., a U. S. corporation formed as a joint enterprise owned by E. I. du Pont de Nemours & Co., Inc., and Procter and Gamble Co. Initial supplies were imported from Germany. Soap, at long last, had a challenger. And even though Gardinol was sold (in 50 per cent strength) at $1.00 per pound it soon won the acceptance of textile processors.

AN EVIDENT MARKET

It was now evident that a market did exist for a synthetic detergent, even if it were a relatively high-cost material. And Gardinol, based on coconut oil, was never going to be very cheap to produce. About the same time National Aniline was pushing investigations of other "soap-like" compounds. The alkyl aryl sulfonates looked promising: they were stable in hard water and in acid solutions; they had excellent detergent properties; and, made from petroleum rather than expensive vegetable oils, they held promise of being produced cheaper and in volume. Thus the Nacconols were born.

The fruits of other research programs

also began to appear on the market. Sulfonated substituted amides, such as Igepon T. were introduced by General Aniline and Film Corp., Lever Bros. Ltd., studied the compound carefully, went so far as to build an acid chloride plant at Hammond, Ind., and contemplated using this facility to condense fatty acids with taurine under General Aniline's I. G. patents. The project did not materialize, however, and General Aniline proceeded to manufacture for its own account and for Colgate-Palmolive-Peet Co. (Arctic Syntex T).

The foregoing covers the most significant developments in the synthetic detergent field up to about 1940. Total output of the then-infant industry is difficult to estimate but probably was close to 100 million pounds per year. Of this total some 50 per cent was National Aniline's low-priced alkyl aryl sulfonate. In the early war period Colgate entered the field with a new compound, a sulfated monoglyceride, trade named Arctic Syntex A. The most recent development is the introduction of detergents made by the sulfonation of an aliphatic hydrocarbon chain. Dupont's Merpol-B in America and the mersolates in Germany are examples of this type of product. Oddly enough, Armour & Co., which is a major factor in the animal fat business, has introduced a petroleum-based detergent as Armour Detergent 411.

It should be mentioned that the products discussed up to this point are true detergents. Broadly speaking, these types represent the entire field. However, due to the impetus which the war-born soap shortage gave to detergent research, hosts of new compounds were born. Many of these do have detergent properties, but most are primarily wetting, dispersing, emulsifying, or penetrating agents.

In considerable measure the tremendous growth of the industry (from about 100 million pounds in 1940 to possibly 600 million pounds in 1947) may be attributed to expanded output of these latter compounds. The cationic wetting agents, such as the quaternary compounds, are, for instance, rapidly growing in commercial stature. Suffice it to say that out of about 400 surface active agents tabulated, only about 125 combine the property of detergency with other characteristics.

In the discussion to follow chief emphasis will be placed on detergents, for space does not permit a study of all surface-active compounds. They consequently will be mentioned only to the extent necessary to permit an adequate understanding of the main subject.

WHAT IS A DETERGENT?

As has been mentioned earlier, one main advantage synthetic detergents have over soaps is the fact that their lime and magnesium salts are fairly water-soluble and do not precipitate from hard water. Too, synthetics can be used in an acid medium and still retain their detergent and foaming properties. Particularly in these two respects do the synthetics differ from soap.

Both soap and the synthetic products are, of course, surface-active agents. Structurewise, too, they are fundamentally similar. All surface-active agents are characterized by having a molecule which carries a hydrophobic (water-hating) hydrocarbon tail and a hydrophilic (water-loving) head. When a detergent dissolves in water the surface molecules are oriented so that their cationic heads point toward the water and the hydrocarbon tails away from it. Thus the surface molecules in a droplet of water containing dissolved soap could be pictured as sketched:

Significantly, the hydrophobic tails are in a unique position to attach themselves to oil or hydrophobic materials such as "dirt." In soap's case the attachment for the dirt is strong enough to permit it to be emulsified and carried away in the rinse water. Soap, therefore, is a detergent.

Many of the synthetics, naturally, have a similar action. And, just as the detergency of soap depends to a considerable extent on the oils from which they are derived and their cationic head, so also are the properties of the synthetics related to the length and type of the hydrocarbon chain and by the nature of the cation. For example, Duponol D consists chiefly of the C_{18} hydrocarbon chain, while Duponol WA is based on a C_{12} fraction. Both are excellent detergents, but the latter is best in cold water, the former in hot.

In this case both are sodium salts, that is they have the same cation. Other cations can be used, of course, and such changes in composition affect the compound propertywise. Sodium derivatives dominate the field, but potassium or amine derivatives are used in the manufacture of shampoos and in a few other special cases.

When the hydrophobic tail of a soap gets out of balance by becoming too long (sodium behenate) or too short (sodium caproate) or internally modified (sodium oleate, sodium ricinoleate) detergency decreases and the material is best suited for non-detergent purposes. Thus compounds not capable of holding "dirt" in suspension become "wetting agents." Unfortunately, no hard and fast rules can be laid down to distinguish between true detergents and wetting agents, for under some conditions of use a product which is normally a wetting agent might become a detergent and vice versa.

By systematically modifying either or both orienting groups the overall characteristics may be changed so that a compound which was a good oil-in-water emulsifier becomes a better water-in-oil, oil-in-oil, or oil-in-solvent emulsifier. In such a case we must alter our conception of a solubilizing head.

In the foregoing diagram of a water droplet let us assume that the droplet is surrounded by oil. This would represent, of course, a water-in-oil emulsion. However, if the droplet were oil, and water the surrounding medium, we would have an oil-in-water emulsion. Thereby the solubilizing group would be the hydrocarbon chain and the surface-active layer of molecules would be heads-out, as diagrammed:

These concepts are of value for determining which compounds of a series are best adapted for any particular use. As yet, however, investigators have done little more than scratch the surface of such problems. Therefore, surface-active agents are classified mainly by use, and categorized as detergents, wetting, foaming, dispersing, penetrating or emusifying agents.

Although synthetic detergents have not as yet corralled any sizable share of commercial laundry business, they do find many special applications, particularly in spotting agents.

Surface-active agents constitute a large class of compounds, and all exhibit some of the aforementioned properties to some degree. Experience teaches us that most compounds do not overlap into more than one or two adjacent groups. Thus, a good wetting agent may be a detergent, albeit a poor one, or a good detergent may be a poor emulsifying agent.

HOW THEY ARE EVALUATED

Detergency, as such, is best evaluated by the Launderometer, where in the amount of dirt removed from soiled materials, under standard conditions, is actually measured. Wetting power is determined by the lowering of interfacial tension. (For a 0.1 per cent solution a value of 30-35 dynes/cm. is good, below this excellent, above 40, poor). The Draves test for sinking time is also useful and frequently utilized.

To appraise emulsifying properties interfacial tension measurements are made, usually against Nujol. Nevertheless, it must be stressed that such data are only comparative for certain conditions. In the final analysis trial runs of any product must be made.

"Soapless soaps," first introduced to the public as shampoos, etc. almost ten years ago, now enter into a myriad of cosmetic formulations. One of the major outlets: bubble bath bases.

In addition to the classifying information cited, it is often desirable to determine the stability of any new compound to acids and alkalies, its resistance to hard water and to other metallic ions, solubility in various media, stability to heat, bactericidal properties, pH of a 1 per cent solution, and so forth.

It is necessary, to further clarify the properties of synthetics, to set up a system of classification. The logical basis for such categorization is by chemical structure. The classification will, however, be kept broad and simple, for too fine a differentiation would require a length of discussion not advisable here.

ALCOHOL SULFATES

A typical example of the first group, the *alcohol sulfates*, is Duponol WA: $CH_3(CH_2)_{10}CH_2OSO_3Na$. This was one of the first of this group commercially available here. Large domestic manufacturers of this type are du Pont and Procter & Gamble.

These detergents are made by sulfation of a long-chain alcohol, which in turn is produced from a natural glyceride either by high-pressure hydrogenation with a copper-chromium oxide catalyst, or by sodium reduction. The products are stable, odorless, highly resistant to decomposition by acid or alkali, compatible with soaps, and unaffected by hard water. Sodium lauryl (a C_{12} alcohol) sulfate, for example, will form a 0.1 per cent solution in the presence of 2500 p.p.m. of calcium or magnesium ions. Similarities are observable between soaps and this type of detergents derived from the same fatty acids.

These materials probably account for 20 per cent of the total production of synthetic detergents. Their price is in the range of 75¢-90¢ per lb. of 100 per cent-active material. Familiar trade names for members of this class are Duponol LS, —OS, —PC, —C, —ME, —D, —WA and —80x, Merpol, Mapro Degum, Maprofix, Orvus WA, Gardinols (now discontinued), Alrosene PD, Avitex C, and Alropon (a secondary alcohol sulfate).

ALKYL ARYL SULFONATES

Monsanto Chemical Co.'s Santomerse D, $C_{12}H_{25}(C_6H_4)SO_3Na$, is a typical example of the *alkyl aryl sulfonates*. Allied Chemical & Dye Corp.'s Nacconols were among the first products in this class, and that firm is still one of the largest producers, controlling many of the basic patents. Its capacity at the end of the war has been estimated at 200,000,000 lbs. per year. Other alkylation processes have recently been exploited, especially by Sharples Chemical Co. and Standard Oil Co. of California's subsidiary, Oronite Chemical Co. The latter firm offers both sulfonated and unsulfonated product for sale; Sharples, on the other hand, offers only three grades of unsulfonated product and licenses buyers under the Thomas patent (No. 1,992,160) to carry out sulfonation. This process, requiring little equipment, enables the operator of a small plant to become a prime producer of a high-quality detergent. It is interesting to note that Sharples has owned the rights to the above-named patent since 1935.

Other products of this class are Alkanol SA, —S, —HG, —B, and Neomerpin (du Pont); Santomerse 1, —2, —3, —55, —D and —S (Monsanto); Kreelon 4D and —7D (Wyandotte Chemicals Corp.); Nekal BX (General Aniline & Film Corp.); Ultrawet (Atlantic Refining Co.); Nopco 1067 (Nopco Chemical Co.; Unitex (Commonwealth Color & Chemical Co.); Sandev-Detergex (Eavenson Chemical Co.); Rinsynol 50L and Sorbit AC (Alrose Chemical Co.); Oranap (Jacques Wolf & Co.); and Lanitol F-S (Arkansas Co.). Some of these producers purchase their raw detergent from prime manufacturers and blend it with other agents to make specialty products for their own markets.

Since the large producers of alkyl aryl sulfonates, such as Monsanto and Allied Chemical, specialize in detergent types, this class is often thought of as yielding detergents only. But various modifications give a wide range of properties, and some products exhibit low detergency and high emulsifying action.

Generally speaking, a small ring structure, such as benzene, together with a single long alkyl chain of 12 to 18 carbon atoms gives the best detergents; examples are Nacconol NR and Santomerse 1. A larger ring structure, such as naphthalene, or a plurality of short alkyl chains tend to reduce detergency and increase emulsifying power; examples are Oronite 5 and Nekal BX.

All of these products have a characteristic kerosene odor, which is reduced to a minimum in the better products. The sodium salts are better in this respect than the potassium salts, and the latter are better in turn than the triethanolamine derivatives. Typical detergents of this class give a good but dispersed lather, which is enhanced by the addition of alkali; the lather is not as good as that produced by the alcohol sulfates, nor will it stand up at high temperatures. They are resistant to bleaching and oxidizing agents, and to boiling 10 per cent acid or 15 per cent alkali. Not as resistant to hard water as the alcohol sulfates, still they are effective in water up to 300 p.p.m. hardness. Water solubility is high, varying from 50 per cent when the number of carbon atoms in the side chain is 8 (Oronite 3), to 6 per cent when the carbon total in the side chains is 30 (Oronite 5).

Various unusual properties are imparted by modification of the attached

groups. Monsanto's Santomerse B, for example, is tasteless and odorless, and therefore suitable for food preparations. It is sodium lauryl sulfobenzoate, $NaO_3S(C_6H_4)COOC_{12}H_{25}$. Solvadene R (Ciba Co.) is an alkyl aryl ether sulfate while Beaconol A (Beacon Co.) is a monoethyl phenyl phenol sodium monosulfonate The latter is prepared in a variety of salts.

Price is lowest of all groups, falling in the vicinity of 40¢ per lb. of 100 per cent-active material. Production is probably about 50 per cent of the total volume of surface-active agents.

ALKYL SULFONATES

The U. S. Tariff Commission Report No. 157, for 1945, lists the *alkyl sulfonates* separately for the first time. Typical examples of this class are du Pont's Merpols B and C: RCH_2SO_3Na.

These differ from the alkyl sulfates in having no oxygen linkage between the carbon and the sulfur atoms. The result is a group of compounds standing midway between the alkyl sulfates and the alkyl aryl sulfonates in stability and detergency, but falling in the price range of the latter. Compounds of this type were used extensively in Germany during the war to replace scarce soap. Known as Mersolate detergents (*Soap & Sanitary Chemicals 23, No. 7,* 40 [1947], they were manufactured by neutralizing an alkyl sulfonyl chloride, Mersol, with caustic soda. Production of these materials has now been undertaken by American firms, among which du Pont is the chief producer. Trade names of compounds falling in this category are Merpol B, —C, MP—189, —189S, —646S, and Avitone A. Armour & Co.'s "411" is a newcomer in the same class.

Production is estimated as 10 per cent of the total production of all surface-active compounds.

SULFATED, SULFONATED AMIDES

The earliest, and one of the more interesting, examples of *sulfated and sulfonated amides and derivatives* is General Aniline's Igepon T, made by the condensation of oleyl chloride with methyltaurine. The sodium salt is $C_{17}H_{33}CON(CH_3)$-$CH_2CH_2SO_3Na$.

The retail market being most aggressively cultivated: household dishwashing compounds.

Detergency and stability of this class are excellent. The foam is fine-textured, voluminous and stable. The sodium salts are odorless, but this is not necessarily true of organic derivatives. The cited characteristics are for neutralized sulfonates of 12 to 18 carbon atoms; but considerable uncertainty exists in many cases as to the exact composition of the product. Unless the manufacturer specifies the type of compound he makes, the only method of arriving at a valid conclusion is by a practical trial.

In addition to Igepon T, a few other representative members of this class are as follows: Alrogel (Alrose); Cominal and Soapotol (Commonwealth Color & Chemical Co.); Mirapon RK (Miranol Chemical Co.); Oratol (Jacques Wolf); Caramide (Carlstadt Chemical Co.); and PD Powder (Eavenson).

Prices of these materials are just under the alkyl sulfates—approximately 70¢ per lb. of 100 per cent active ingredient. Production is probably between 5 and 10 per cent of the whole.

SULFATED, SULFONATED ESTERS

A typical example of *sulfated and sulfonated esters* is General Aniline's Igepon AP, $RCOOCH_2SO_3H$, where R is $C_{12\text{-}18}$. Another type is Arctic Syntex M, $RCOOCH_2CHOHCH_2OSO_3Na$. This compound formed by sulfation of a monoglyceride, is a product of Colgate-Palmolive-Peet Co.

Upon examination it is apparent that Igepon AP is a sulfonate and Arctic Syntex M, a sulfate. This is not an important distinction in this series, for the weak link is in the —O— of the ester group. These compounds, while excellent detergents, are not stable to strong acid nor alkali; they will, however, stand moderate amounts of soda ash, phosphates, etc., which greatly improve their detergent action. They are unaffected by hard water. Except for their inferior stability, they closely resemble the sulfated and sulfonated amides in all characteristics.

This class, together with the polyhydric monoesters, probably represents between 5 and 10 per cent of total detergent output. Typical trade names are Halo and Vel (Colgate-Palmolive-Peet Co.); Igepon AP (General Aniline); and Surfax WO (E. F. Houghton & Co.).

Closely related are the non-sulfated nor sulfonated *polyhydric monoesters.* These surface-active agents depend on a multiplicity of hydroxyl groups for their hydrophilic character, and they are therefore non-ionic. Several of them are detergents, but they are better known as emulsifying and thickening agents. Typical of this class are Atlas Powder Co.'s Spans and Arlacels, which are fatty acid monoesters of sorbitol anhydride with or without alkylene oxide modification. Another group of Atlas products, Tweens and the G series, are esters of alkylene oxide condensation products. Pentamulls, fatty acid esters of pentaerythritol, are products of Heyden Chemical Corp. Glyco Products Co., among others, makes a wide range of glycerol monostearates, ricinoleates, linoleates, and many others.

SULFATED, SULFONATED AMINES

The *sulfated and sulfonated amines* are not a well defined group commercially. They are excellent detergents when the alkyl chain length is C_{12} to C_{18}, but the expense of manufacture is high and the product price is about $1.25 per lb. of

A unique use: apple on the left was peeled manually, as sparingly as possible. Nevertheless, peel represented 10 per cent of weight. One on the right was peeled chemically, by use of 10% lye, 0.5% alkyl aryl sulfonate. "Chemical" peel represents only 6% of weight.

100-per cent material. The cost varies greatly, of course, with different types. Examples of this group are Detergent D (Ciba Co.); Sulfatex (L. Sonneborn Sons, Inc.); Sulframine LW, –BLX and –DT (Ultra Chemical Co.); and Ninol 737 and –400 (Ninol Laboratories).

MISCELLANEOUS TYPES

Other structural breakdowns are possible, but since they often include only isolated examples, only the more important will be mentioned here.

Triton X-200, a product of Rohm & Haas Co., is the sodium salt of an alkyl aryl polyether sulfonate having considerable detergency, great stability and resistance to hard water. The unsulfonated alcohol, which is still surface-active by virtue of the polyether groups, is the non-ionic wetting agent Triton X-100. Many modifications are available.

American Cyanamid Co.'s Aerosols are an interesting series of succinic acid-derived compounds. Aerosol 18 is $NaOOCCH_2CH(SO_3Na)CONHC_{18}H_{37}$. Aerosol 22 is $NaOOCCH_2CH(SO_3Na)CON(C_{18}H_{37})(CH(CH_2COONa)COONa)$. These are the best detergents in the series. The sodium sulfosuccinic esters are chiefly wetting agents; Aerosol AY is the diamyl ester, –MA the dihexyl, –IB the diisobutyl, and –OT the dioctyl ester.

Maypon K, –Super K and –4C, manufactured by Maywood Chemical Works, are excellent detergents based on proteins. The price range of these miscellaneous types is quite variable, but it is generally over 75¢ per lb. on a 100-per cent basis.

CATIONIC AGENTS

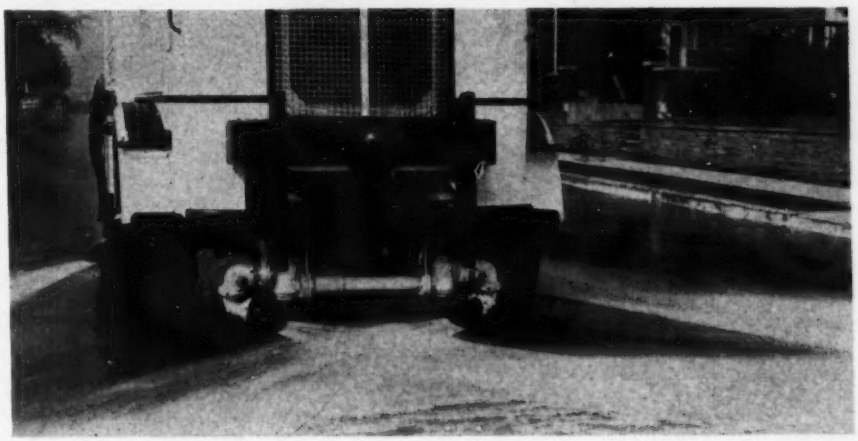
Of constantly increasing importance are the *quaternary ammonium compounds*, the most important of the cationic surface-active agents. Accounting for 1½ per cent of total 1944 production of surface-active agents, they advanced to slightly over 2 per cent in 1945. (U. S. Tariff Commission Reports No. 155 and 157).

Considerable disagreement has arisen over whether these materials should be classified as detergents or merely as wetting agents. Such difference of opinion, the writer believes, arises over the definition of a detergent. It would appear that their high price, ranging from $1.50 to $2.25 per lb. (100 per cent basis), together with their high germicidal power, would preclude their use in concentrations comparable to soap. They do have high foam value, however, and undoubtedly act together with water to emulsify and wash away dirt in addition to their main rôle as germicides.

They are not compatible with soap nor with anionic synthetic detergents. A consideration of the ions involved will show why this is true: The large portion of the quaternary ammonium compound, being positively charged, will combine with the large, negatively charged portion of the anion-active material, giving an intractable, insoluble precipitate.

Typical examples of this class are the alkyl dimethyl benzyl ammonium chlorides. In Onyx Oil & Chemical Co.'s "BTC" cationic detergent, the alkyl group varies from C_8 to C_{18}. Other compounds in this class are Agent M (American Cyanamid); LPC (Hooker Electrochemical Co.); Alrosept (Alrose); Amine 220 and –ES (Carbide & Carbon Chemicals Corp.); Octab (Rhodes Chemical Corp.); and Triton X-400 (Rohm & Haas). Sapamine (Ciba) is a cationic detergent but not a quaternary salt.

It might be mentioned in passing that all detergents can be classified as non-ionic, anionic or cationic. The polyhydric monoesters, for example, are non-ionic. Compounds of the latter type are compatible with both of the other types, but cationic and anionic types are incompatible with each other. Additional examples of non-ionic detergents are Betanol (Beacon Co.) and Intral (Synthetic Chemicals, Inc.).



Chief dirt-catcher on pavements are grease and oil, untouched by ordinary water flushing. Recently, however, the City of Toronto took advantage of detergents, flushed streets super-clean. A few years ago synthetics were too costly for such uses.

TRADE NAMES

Manufacture of synthetic detergents falls pretty well into three categories:

(1) The large manufacturer of a prime type.

(2) The small manufacturer working under a royalty or license arrangement with an associated company, and selling his product to distributors, compounders, or the retail trade. Such companies usually confine their manufacturing to such simple operations as sulfonation or esterification. This is undoubtedly a result of the present patent structure in the field as well as of capital investment considerations.

(3) The compounder who buys the synthetic, adds a builder or not, applies a new trade name to it, and sells it through distributors or at retail.

There are many further combinations and arrangements possible, and one could inevitably find an example of each. The important result is that new trade names are applied all along the line, and one material may be renamed two or three times as it runs the gamut from primary producer to ultimate consumer.

Among these smaller manufacturers and distributors, the trade name usually has little relation to the product. In general, the smaller the company, the fewer are the disclosures in the literature on chemical constitution. Larger companies, having many lines of products, are generally more systematic in trade-naming and more open in their disclosures. In such cases a study of the system is helpful.

For example, the Aerosol trade name followed by a combination of letters signifies an ester. In American Cyanamid's series of compounds the number following the name signifies the strength: Areskap–100 is a 100-per cent solution, Areskap–50, a 50-per cent solution, etc. The code number following Span or Tween indicates fatty acid chain length: thus, Span–40 is sorbitan monopalmitate, –60, the stearate, and –80, the oleate. But when Span–40 and Tween–40 are mixed, the product is G–2000 C.

In general, trade names are quite unreliable as criteria of chemical constitution. Surfax WO is a sulfated fatty ester; Surfax TR, an alkyl sulfonate. Aerosol and Betasol are the same product, but American Cyanamid uses the latter name when dealing with the leather industry. Orvus is Procter & Gamble's name for Du Pont's Duponol. Santomerse D is an alkyl aryl sulfonate, but Santomerse DT is an alkylene polyamine. Colgate's Arctic Syntex T is an amide derivative, but Arctic Syntex A is an ester. There is no safe way of interpreting trade names except on an individual basis. Convenient lists have been prepared, and these are helpful to the investigator.

So far emphasis has been placed on

detergents proper, but mention should be made of a number of detergent-based products which soap manufacturers and chemical companies are placing on the retail market. Procter & Gamble, which has marketed Dreft for a number of years, is now introducing another packaged specialty under the trade name Tide. It is being test marketed in the Albany area, soon will be distributed nationally. Monsanto's Sterox, packaged by Detergents, Inc., Columbus, Ohio, is being marketed as All, mainly through appliance stores. Lever Bros. is promoting Breeze in the Midwest, and National Aniline's Nacconol, under the brand name Swerl, is being distributed in both the U. S. A. and Canada by the H. J. Heinz Co. General Aniline & Film Corp. is introducing a liquid cleaner, Glim, in the Washington, D. C. market.

These activities should not be confused with the immediate wartime splurge of household cleaners containing some synthetics and a heavy proportion of builders. Many of these products, made by smaller concerns, may have served a useful purpose, but as often as not they were not well formulated. There is, of course, no reason to believe that the path now being blazed by the larger companies will not be followed by many smaller concerns. Certainly raw materials of good quality are now available.

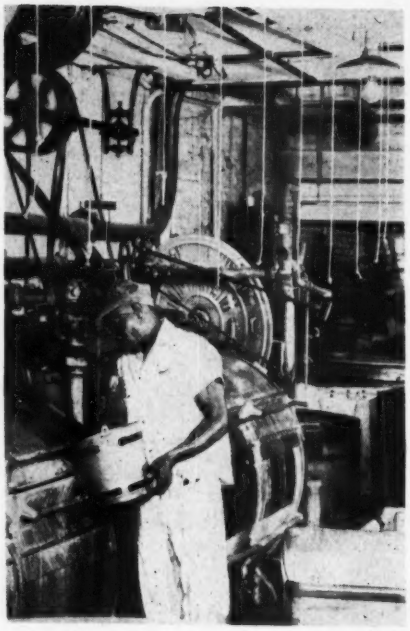
BURGEONING OUTPUT

The present production of synthetic detergents is placed at about 600 million pounds, based on U. S. Tariff Commission Reports 155 and 157 and the preliminary report for 1946. They list a total output, exclusive of sulfated and sulfonated oils, of 123,866,000 lbs. (1944), 141,242,000 lbs. (1945) and 200,860,000 lbs. (1946). Since most of this is sold as 33 per cent active material, total sales should approximate 370 million pounds, 425 million pounds and 600 million pounds respectively, for the three years cited. This represents about 7½ per cent of soap production, if soap output is calculated on the basis of raw materials consumed. However, it is the writer's opinion that most of the synthetic detergent output up to the present time at least is being absorbed in fields where soap cannot be used. It is not believed that the synthetics have made any substantial inroad into retail soap markets.

Moreover, a good deal of the growth of the "synthetics" industry is regarded as being due to the wide introduction of wetting and emulsifying agents. It is consequently revealing to pass over the multifarious fields in which the newer compounds are used.

TEXTILE NEEDS

The textile industry comes first, both chronologically and in respect to present volume. In this field particularly are



The textile industry, first to use synthetics, also ranks as today's leading consumer.

detergency and wetting characteristics of prime importance. Detergency is essential for degumming, desizing, scouring and washing operations; wetting contributes to dye levelling, bleaching, mercerizing, etc.

For general washing, scouring and finishing operations almost any type of detergent is satisfactory. For carbonizing wool, mercerizing cotton, vat and acid dyeing, compounds stable in strong acid and alkali are required. Bleaching processes require agents resistant to the specific chemicals employed and the choice depends on whether that is a dichromate, peroxide, or other reagent. Kier-boiling, stripping, felting, backwashing and fulling are other specialized procedures in textile processing which require specific agents. Specific formulations are marketed as penetrants for yarn conditioning, wool oil removers, acid dye assistants, cationic lubricants, etc.

Detergency, compatibility with alkaline builders, and stability in storage are requisite properties for laundry and household cleaning compounds. In wire pickling baths, and electroplating processes, the synthetic's chief function is to lower the surface tension so that absolute contact can be made between the metal and the lectrolyte. Usually an acid resistant compound is specified.

Numerous other uses, where the wetting-out action is the important requisite, can be cited. Filter cloths, for instance, are wetted out with a synthetic, whereby initial back pressure is reduced. In certain food preparations a small percentage of edible wetting agent speeds up manufacturing operations.

In the tanning of leather, synthetics facilitate fat liquoring, dyeing, deliming and degreasing. Papermakers employ detergents for de-inking, felt cleaning and pulping. A growing market, and one receiving special attention at present, is the formulation of insecticides. Here a number of agents are used to emulsify toxicants, and as wetting agents to improve field applications.

The quaternary ammonium salts, which rank high as fungicides and germicides and in addition possess wetting and emulsifying qualities, are used extensively in the dairy industry and, of course, for general sanitizing in restaurants, etc. Anionic detergents also have some similar characteristics and inhibit mold growths.

In any case, it is abundantly clear that these newer compounds have become well established in a variety of fields.

FUTURE OUTLOOK

But what about the future?

It is not anticipated by the writer that the next few years will be marked by the introduction of many new compounds; the main developments, rather, will be in the field of use. Most of the progress can be expected to grow out of chemical engineering advances, too, rather than out of pure research. Manufacturing operations will be extended, no doubt, as early patents lapse.

One other point warrants consideration. Soaps themselves have not been too well exploited, but there are opportunities in this field. Perhaps the swift rise of the synthetic detergent business may spur the entire detergent industry—of which soapmakers are by all means the dominant factor—to further investigate the potentialities of their raw materials, their processes, their products.

If this situation materializes, and there are indications that there is a trend in that direction, soaps may well enter new fields and fill new needs. Thus, even though synthetics may represent 600 million pounds of cleaners annually, soap, tonnagewise, may well hold its own.

Or, to phrase it somewhat differently, the last few years have witnessed major advances in the field of detergents; it is but the beginning. The whole industry—chemical manufacturers, soap makers, consumers too—will work together to advance the art in the years ahead.

REPRINTS

Reprints of this report are available at 50 cents a copy. Special prices will be quoted on quantities of five or more to be mailed to one address. Send requests to Editorial Department, Chemical Industries, 522 Fifth Ave., New York 18, N. Y. Remittance must accompany order. Stamps acceptable.

Trade Name	Manufacturer	Class and Formula	Principal Uses	Approximate Conc.	Remarks
Acidol	Onyx Oil & Chem. Co.	Salt of a tertiary amine	Wetting Agent		Textile processing, carbonizing wool, electroplating.
Acimul	Glyco Products		Emulsifier		Non-ionic, tan solid. Recommended whree acid or acid salts are present.
Aciterge	Commercial Solvents Corp.	Fatty acid salt of substituted oxazoline.	Detergent, Wetting Agent.		Product discontinued at present time.
Acto-450	Stanco, Inc.	Sodium petroleum sulfonate	Emulsifier, Detergent.	45%	Liquid, anionic, mol. wt. 465-480.
Acto-500	Stanco, Inc.	Sodium petroleum sulfonate.	Emulsifier, Detergent.	50%	Liquid. Flows at normal temperatures.
Acto-550W	Stanco, Inc.	Sodium petroleum sulfonate.	Detergent, Wetting Agent.	57%	Aqueous paste.
Acto-600	Stanco, Inc.	Sodium petroleum sulfonate.	Emulsifying.	60%	Tan solid, used chiefly as a fat splitting agent.
Acto-630	Stanco, Inc.	Sodium petroleum sulfonate.	Emulsifying.	63%	For cutting oils, rust inhibitors, etc.
Acto-700	Stanco, Inc.	Sodium petroleum sulfonate.	Emulsifying	70%	For cutting oils, rust inhibitors, etc.
Advawet 33	Advance Solvents & Chemical Corp.		Wetting, Emulsifying.	100%	Developed for emulsion paints.
Advawet NA-6	Advance Solvents & Chemical Corp.		Wetting, Emulsifying		Viscous liquid, water soluble, non-ionic. Textile wetting agent.
Aerosol AY	American Cyanamid Co.	Diamyl ester of sulfosuccinic acid ($C_5H_{11}COOCH_2CHSO_3NaCOOC_5H_{11}$)	Wetting, Dispersing.	100%	Anionic, solid, water-soluble, best with electrolyte.
Aerosol AS	American Cyanamid Co.	Same as Aerosol-OS in water and solvent.	Wetting.	50%	See Aerosol-OS.
Aerosol IB	American Cyanamid Co.	Di isobutyl sod. sulfo succinate.	Wetting, Dispersing.	100%	Best of Aerosols for wetting in presence of high electrolyte.
Aerosol MA	American Cyanamid Co.	Dihexyl ester of sod. sulfosuccinic acid.	Wetting, Dispersing.	100%	Less water soluble than Aerosol OT. Foaming poor. Use: dry cleaning.
Aerosol OS	American Cyanamid Co.	Isopropyl naphthalene sod. sulfonate.	Wetting, Dispersing.	95%	Very resistant to acids and alkali and to electrolytes.
Aerosol OT	American Cyanamid Co.	Dioctyl ester of sod. sulfosuccinic acid.	Wetting, Dispersing.	100%	Wax-like, hydroscopic, water-soluble to form gel at 50%. Best wetting agent of series, but least stable.
Aerosol OT Paste	American Cyanamid Co.	An 85% sol. of Aerosol-OT above.			
Aerosol-OT Clear 70%	American Cyanamid Co.	A 70% sol. of Aerosol-OT above.			
Aerosol-OT-C	American Cyanamid Co.	A 10% Aerosol-OT in an organic solvent.			Discontinued at present time.
Aerosol 18	American Cyanamid Co.	N-octadecyldisodium sulfosuccinamate.	Detergent, Wetting.	35%	Mainly a detergent. Anionic, white paste.
Aerosol-22	American Cyanamid Co.	N-octadecyl tetrasod. (1, 2-dicarboxyl ethyl sulfosuccinamate.)	Detergent, Wetting.	95%	Granular yellow solid, anionic. Similar to Aerosol-18 in detergency.
Aframine DCA	Michel Co., Inc.	Sulfated glycerylamide.	Detergent.		Name discontinued, see Michelene DCA.
Agent M	American Cyanamid Co.	Myristamidopropyl dimethyl benzyl ammonium chloride $C_{13}H_{27}CONH(CH_2)_3N(CH_3)_2CH_2C_6H_5 \cdot Cl$	Bactericide.		Phenol coeff. at 37°C on S.A.-4-800. Some detergency.
Ahco Penetrant L	Arnold, Hoffman & Co.	Alkyl aryl sulfonate	Detergent, Wetting.		Discontinued.
Ahcowet ANS	Arnold, Hoffman & Co.	Alkyl aryl sulfonate.	Wetting.		Textile, leather, etc.
Ahcowet RS	Arnold, Hoffman & Co.	Ester sulfonate.	Wetting.		Textile, leather, etc.
Aldo 33	Glyco Products Co.	Glycerol monostearate.	Emulsifying.	100%	Edible, used in baking, ice cream, cosmetics.
Aliphatic Ester Sulfate	Onyx Oil & Chemical Co.	As given in name.	Wetting, Emulsifying.		Textile finishing and processing; pigment dispersion and dye levelling.
Alkamine SJ	Amalgamated Chem. Corp.	Sulfated fatty amine.	Detergent.		Textile processing.
Alkanol B	E. I. du Pont de Nemours & Co.	Alkyl naphthalene sulfonate.	Wetting, Dispersing.		Anionic, a naphthalene alkyl derivative, Textiles, metal cleaning.
Alkanol-HG	E. I. du Pont de Nemours & Co.	Alkyl naphthalene sulfonate.	Penetrant.		Temporary anti-mildew.
Alkanol SA	E. I. du Pont de Nemours & Co.	Alkyl naphthalene sulfonate.	Wetting, Dispersing.		Powder, anionic, soluble in water, alc. and acetone. Wetting efficiency good.
Alkanol S-Flakes	E. I. du Pont de Nemours	Tetrahydronaphthalene sulfonate.	Dispersing, Solubilizing.		Increases solubility of many synthetic detergents. See Sod. xylenesulfonate below.
Alkanol WXN	E. I. du Pont de Nemours & Co.	Alkyl sulfonates.	Wetting, Penetrating, Rewetting.		Most efficient of du Pont wetting agents except Duponol ME dry.
Alkaterge-C -O -OX	Commercial Solvents Corp.	Substituted oxazoline.	Emulsifying, Wetting, Detergent.	100%	1% in mineral oil lowers interfacial tension against water more than 95%. Textiles lubricating oils, paints.
All (retail)	Detergents, Inc.	Alkyl aryl sulfonate.	Detergent.		Similar to Sterox. Little foam, good detergency.
Alox series	Alox Corp.	Complex methyl esters of high mol. wt., acids, and lactones. Also the amine salts of long chain acids, and sulfonates of long chain alcohols.	Wetting, Emulsifying.		Lubricating, and for enhancing wetting properties of oils and displacing water in control of metal corrosion.
Alphasol	American Cyanamid Co.		Wetting.		Old name for Aerosols which see.
Alrogel	Alrose Chemical Co.	Fatty amide sulfate.	Detergent.	17%	Textile scouring agent, thickener in presence of electrolyte.
Alromine S-50	Alrose Chemical Co.	Fatty alkylol amine condensate.	Emulsifier.	50%	Anionic substantive textile softener.
Alromine R-53	Alrose Chemical Co.	Fatty alkylol amine condensate.	Emulsifier.	53%	Cationic substantive textile softener.
Alronol 90AC	Alrose Chemical Co.	Fatty alkylol amine condensate.	Emulsifier.		Dilute form of Alrogel.
Alropon	Alrose Chemical Co.	Salt of a sec. alcohol sulfate.	Detergent.	65%	Wool scouring, cream shampoo, softener.
Alropon 30	Alrose Chemical Co.	Salt of a sec. alcohol sulfate.	Detergent.	30%	Dilutesolution of Alropon. Discontinued.
Alrosene 15W	Alrose Chemical Co.	Salt of a sec. alcohol sulfate.	Detergent, Wetting.	17%	Same as Alrosene NA diluted. Discontinued.
Alrosene 31	Alrose Chemical Co.	Modified alcohol sulfate.	Detergent.	31%	Household and textile detergent.
Alrosene NA	Alrose Chemical Co.	Sod. salt of mod. alcohol sulfate.	Detergent, Wetting.	19%	Discontinued.
Alrosene NC	Alrose Chemical Co.	Modified alcohol sulfate.	Detergent.	17½%	Textile; soaping prints, etc.
Alrosene K	Alrose Chemical Co.	The potassium salt of Alrosene NA			Discontinued.
Alrosene LS	Alrose Chemical Co.				Discontinued.
Alrosene PD	Alrose Chemical Co.	Modified alcohol sulfate.	Detergent.	15%	Same as Alrosene 31.
Alrosept	Alrose Chemical Co.	Quaternary ammonium compound.	Germicide, Wetting.	25%	Cationic wetting agent, detergent, asphalt additive, bactericide.
Alrosol	Alrose Chemical Co.	Fatty alkylol amine condensate.	Detergent, Wetting.	87%	Nonionic detergent, thickener, wetting agent, lubricant.
Alrosol C	Alrose Chemical Co.	Fatty alkylol amine condensate.	Detergent, Wetting.	100%	Nonionic detergent, wetting agent with improved compatibility to electrolyte.
Alrosol H	Alrose Chemical Co.	Fatty alkylol amine condensate.	Detergent, Wetting.	87%	Same as Alrosol, modified to give increased viscosity at 5 to 15% concentration.
Alrosol O	Alrose Chemical Co.	Fatty alkylol amine condensate	Emulsifying	100%	Nonionic emulsifier and dispersing agent. Poor detergent and wetter.
Alrosol S	Alrose Chemical Co.		Emulsifying	100%	Nonionic emulsifier, dispersant, thickener stabilizer.
Alroterge	Alrose Chemical Co.	Alkyl naphthalene sulfonate.	Detergent, Wetting.	35%	General purpose industrial detergent.

Trade Name	Manufacturer	Class and Formula	Principal Uses	Approximate Conc.	Remarks
Amecco 198-A	Amecco Chemicals.		Detergent	30%	Liquid, anionic. Use: Textile, leather, cosmetics, paints.
Amine 220	Carbide & Carbon Chemicals Corp.	A condensation of an oleic acid and aminoethylethanolamine.	Detergent.		See U. S. Pat. 2,267,965. Cationic, Emulsifier for dilute acids for agricultural sprays.
Amine ES	Carbide & Carbon Chemicals Corp.	The ester of stearic acid and diethylethanolamine. $R\text{-}COOCH_2CH_2N(C_2H_5)2$.			A cationic emulsifying agent. Useful under acid conditions.
Amine O	Alrose Chemical Co.	Heterocyclic tertiary amine.	Emulsifier.	100%	For insecticides, flotation processes, acid cleaners, dispersants. Cationic.
Aquatergent	Aqua-Sec. Corp.	Sulfated boro fatty acid amide.	Detergent.		Textiles.
Arctic Syntex A	Colgate-Palmolive-Peet	Sod salt of a sulfated fatty ester $R\text{-}COOCH_2CH_2O\text{-}SO_3Na$ possibly.	Detergent.		Detergency excellent. Not recommended with alkali or soaps. Not stable to strong acid or alkali.
Arctic Syntex M	Colgate-Palmolive-Peet.	Sulfated monoglyceride $R\text{-}COOCH_2CHOHCH_2OSO_3Na$.	Detergent.		Not stable to strong alkali. Detergency excellent.
Arctic Syntex M liquid	Colgate-Palmolive-Peet	The ammonium salt of above.	Detergent.		For preparations requiring a liquid; rug cleaners, bubble bath preparations.
Arctic Syntex T	Colgate-Palmolive-Peet	Substituted amide.	Detergent.	90%	Powder, or paste (95%). Excellent detergent in acid alkali, and hard water. More stable than the "A" or "M" types.
Areskap 100	Monsanto Chemical Co.	Monobutylphenyl-phenol sod. monosulfonate. $(C_4H_9(SO_3Na)C_6H_3\text{-}C_6H_4(OH)$.	Wetting.	100%	Insecticides, embalming fluids.
Areskap 50	Monsanto Chemical Co.	Monobutylphenylphenol sod. monosulfonate. $(C_4H_9(SO_3Na)C_6H_3\text{-}C_6H_4(OH)$.	Wetting.	50%	A 50% solution of Areskap 100.
Aresket 300	Monsanto Chemical Co.	Monobutyl biphenyl sod. monosulfonate.	Wetting.	100%	Solvency increased for organic solvents, decreased for polar solvents.
Aresket 240	Monsanto Chemical Co.	Monobutyl biphenyl sod. monosulfonate.		40%	Industrial sprays, etc. A 40% active solution of above.
Aresklene 400	Monsanto Chemical Co.	Dibutylphenylphenol sod. disulfonate.	Wetting, Emulsifying.	100%	Dry hydroscopic powder, decomposes above 160°C. Water and polar solvent solubility good. Principal use as a wetting agent in the application of rubber to fabric.
Aresklene 375	Monsanto Chemical Co.	Dibutylphenylphenol sod. disulfonate.	Wetting, Emulsifying.	75%	A 75% sol. of above.
Arlacel 20	Atlas Powder Co.	Sorbitan monolaurate.	Emulsifier.	100%	Cosmetic grade of Span 20.
Arlacel 40	Atlas Powder Co.	Sorbitan monopalmitate	Emulsifier.	100%	See Span 40 (Cosmetic Grade).
Arlacel 60	Atlas Powder Co.	Sorbitan stearate	Emulsifier.	100%	See Span 60.
Arlacel 80 and 85	Atlas Powder Co.	Sorbitan oleate.	Emulsifier.	100%	See Span 80 and 85.
Arlacel 83	Atlas Powder Co.	Sorbitan sesquioleate.	Emulsifier.	100%	Cosmetic grade of Arlacel C (see below).
Arlacel-C	Atlas Powder Co.	Sorbitan sesquioleate	Emulsifier.	100%	Non-ionic oily liquid, neutral, emulsion characteristics excellent. Use: Drugs, cosmetics.
Arquad-12 Arquad-14 Arquad-16 Arquad-18	Armour & Co.	Quaternary ammonium compounds of form. $R\text{-}N(CH_3)3\text{-}Cl$.	Germicide, Wetting, Detergent.	33%	Number refers to carbon atoms in chain (over 90%), T, to tallow, C to Coconut fatty acids and S to Soy bean fatty acids. Surface tension data low. Use: Germicidal cleaners, air conditioning, ore flotation, textile treating.
Arylene	Hart Products	Alkyl aryl sulfonate.	Detergent.		Textiles.
Aurinol-D	Onyx Oil and Chem. Co.	Sulfated fatty alcohol blend.	Detergent.		Textile processing, scouring and dyeing.
Avitex AD	Du Pont	Sulfated alcohol derivative.	Wetting.		Textile processing.
Avitex C	Du Pont	Modified alcohol sulfate.	Wetting.		Anionic, paste, textiles.
Avitex R	Du Pont	Alkyl amine derivative.			Antistatic.
Avitex SF	Du Pont	Alcohol sulfate.	Wetting.		Textile processing.
Avitex W	Du Pont	Alcohol sulfate.	Wetting.		Textile processing.
Avitone A	Du Pont	Hydrocarbon sulfonate.	Wetting, Penetrant.		Textile use—carding, spinning, fulling, etc.
Base 401	E. F. Drew & Co.	Fatty acid condensate.	Emulsifying.	98%	For DDT in solvents, etc.
Beaconol A	Beacon Co.	Monoethyl phenyl phenol sod. sulfonate.	Wetting, Dispersing.		Discontinued.
Beaconol M	Beacon Co.	Above, only the pot. salt.	Detergent, Wetting, Dispersing.		Few products so modified. See below.
Beaconol S	Beacon Co.	Above, only the ammonium salt.			
Beaconol T	Beacon Co.	Above, only the guanidine salt.			Use in inks, paints, etc.
Bemul	Beacon Co.	Glycerol monostearate.	Emulsifying.	100%	Water dispersable; use in cosmetics, shortening, lubricating oils.
Betanol 152 564 701	Beacon Co.	High mol. wt. ester.	Emulsifying, Wetting.		This group has wetting properties suitable for textile work.
Betanol 401 520 540 560	Beacon Co.	High mol. wt. ester.	Emulsifying.		More oil-soluble and useful in cosmetics, paints, pharmaceuticals.
Betasol	American Cyanamid Co.				Name given Aerosols when sold to tanning trade.
Betasol-OT-A	American Cyanamid Co.	Sulfonated ester of a dicarboxylic acid, $COOR$, $CHSO_3$, Na, CH_2, $COOR$	Wetting.	25%	Leather industry.
Breeze (retail)	Lever Bros.		Detergent.		Recently placed on market.
BTC	Onyx Oil & Chemical Co.	Alkyldimethylbenzyl ammonium chloride.	Germicide.	50%	Cationic, liquid, not affected by hard water, phenol coeff. on S. A. not less than 200.
Caramide	Carlstadt Chem.	A sulfated amide.	Detergent.		Excellent fine foam. Textile, laundry, etc.
Catiosan	Onyx Oil and Chem. Co.		Detergent.		Cationic detergent.
Catiosan T	Onyx Oil and Chem. Co.		Detergent, Germicide.		Cationic detergent sanitizer for medical and dental personnel and equipment.
Cerfak	E. F. Houghton & Co.	Alkylated aromatic hcb. sulfonate.	Detergent.		Textile. Alkyl group is mixed dodecyl radicle.
Cerfak N-100	E. F. Houghton & Co.	Probably a substituted amide.	Detergent.	100%	Stable to acids and alkalis and to hard water. Textile scouring, dyeing, etc.
Cetab	Rhodes Chemical Co.	Cetyl trimethyl ammonium bromide $C_{16}H_{33}N(CH_3)_3Br$.	Germicide.	100%	A pharmaceutical product.
Cetylon	Rhodes Chemical Co.	Cetyl dimethyl benzyl ammonium chloride.			See Rodalon and Octab also. This compound has properties between above.
Charlab Condensate	Charlotte Chemical Laboratories.		Wetting.		Fungicide. Textile.
Cominol	Commonwealth Color and Chem.	Amide derivative.			Same as Soapotol only more refined.
Darvan No. 1	R. T. Vanderbilt Co.	Sod. salt of polymerized alkyl aryl sulfanic acids.	Dispersing.		Latex, paper, leather.
Darvan No. 2	R. T. Vanderbilt Co.	As above.	Dispersing.		Same uses as above. Difference lies in solubilities.
Daxad No. 11	Dewey & Almy Chemical Co.	Sod. salt of condensed alkyl aryl sulfonic acid.	Dispersing, Emulsifying.		A dispersing agent with special properties.
Daxad No. 23	Dewey & Almy Chemical Co.	Sod. salt of condensed alkyl aryl sulfonic acid.	Dispersing, Emulsifying.		An emulsion stabilizer.
Decab	Rhodes Chemical Co.	Octadecenyl-2, dimethyl benzyl amm. chloride.	Germicide.		Same as Octab, with oleic acid replacing stearic.
Deceresol OT	American Cyanamid Co.	Dioctyl ester of sod. sulfosuccinic acid.	Wetting.	25%	Textile only.

Trade Name	*Manufacturer*	*Class and Formula*	*Principal Uses*	*Approximate Conc.*	*Remarks*
Dergon OM	Arkansas Co.	Amino fatty ester.	Detergent.		Textile, leather.
Detanol A	Commonwealth Color & Chemical Co.	Hydrocarbon sulfonate.	Detergent, Wetting.		Textile.
Detergent D	Ciba Co.	Amino condensation product.	Wetting.	10%	
Detergent 31	Eavenson Chemical Co.	Modified alcohol sulfate.	Detergent.	31%	Powder, anionic. Note similarity to NR-31.
Detergent 35	Eavenson Chemical Co.	Alkyl aryl sulfonate.	Detergent.	35%	See also RN-35.
Detergent 85	Eavenson Chemical Co.	Alkyl aryl sulfonate.	Detergent.	85%	General detergent use in industrial and household cleaners, textile, etc.
Detergent 240	Arnold, Hoffman & Co.	Alkyl aryl sulfonate.	Detergent.	30% Est.	Emulsyfiing power good; wetting, fair.
Diglycol-laurate -oleate -stearate	Glyco Products Kessler Chem. Co., etc.	As in name.	Emulsifying.	100%	Non-ionic, laurate is water insol., stearate-water dispersable.
Dipex	Stanco, Inc.	Sod. salt of sulfonated petroleum hydrocarbons.	Wetting, Lubricating.		Textile, rubber mold lubricant, etc.
Dreft (retail)	Procter and Gamble Co.	Fatty alcohol sulfate.	Detergent.		Household cleaner, laundry.
Drench	Arnold Hoffman & Co.	Alkyl aryl sulfonate.	Wetting.		Special use of wetting agent for fire-fighting.
Drene (retail)	Procter and Gamble Co.	Fatty alcohol sulfate (probably the triethanolamine derivative.	Detergent.		Hair shampoo.
Duponol C	Du Pont	Sod. lauryl sulfate.	Detergent.		Meet specification of U.S.P. XIII.
Duponol D	Du Pont	Sod. sulfated mixed alcohol.	Detergent.		A paste for general heavy duty detergent use.
Duponol G	Du Pont	Higher alcohol derivative.	Emulsifying.		
Duponol-LS	Du Pont	Ocenol sulfate.	Detergent.		Scouring agent. Comes in flake and paste form.
Duponol ME dry	Du Pont	Technical. Sod. lauryl sulfate.	Detergent, Dispersing, Emulsifying.		Wetting properties very efficient. Detergency excellent.
Duponol OS	Du Pont	Higher alcohol derivative.	Emulsifying.		Emulsifying agent for O/W emulsions.
Duponol PC	Du Pont	The sulfate from lauryl alcohol.	Detergent.		Cosmetic grade of Duponol WA below.
Duponol WA	Du Pont	Alcohol sulfate.	Detergent, Wetting, Dispersing.		Comes in paste, and flake form. More water-soluble than Duponol D and lathers better in cold water.
Duponol WS	Du Pont	Higher alcohol derivative.	Emulsifying.		Emulsifying agent for W/O emulsions.
Duponol-80	Du Pont	Octyl alcohol sulfate.	Penetrant, Dispersant.		Very soluble. Used in electroplating baths, tanning of leather, etc.
Dynesol K 50	Amalgamated Chemical Corp.	Sod. salt of sulfated ester of naphthalene.	Penetrant.		Textile.
Emcol 888	Emulsol Corp.	Polyalkylnaphthalene methyl pyridinium chloride.	Germicide.	40%	Cationic, for use in sanitizing solutions.
Emcol 3178-S	Emulsol Corp.	Sod. alcohol sulfate.	Detergent, Wetting.	30%	Comparable with other alcohol sulfates of equal concentration.
Emcol 3180	Emulsol Corp.	Sod. alcohol sulfate.	Detergent, Wetting.		Use: Cream shampoos, etc.
Emcol 4150	Emulsol Corp.	Complex fatty acid derivative of aliphatic sulfonate.	Detergent, Wetting	35%	Completely water sol. For cosmetics, textiles.
Emcol 5100	Emulsol Corp.	Alkanolamine fatty acid condensate.	Wetting, Detergent.	90%	Solution becomes viscous with addition of water. Thickening agent, emulsifier, etc.
Emcol H-47	Emulsol Corp.	Fatty acid condensate of polyhydric alcohol.	Emulsifier.	100%	Used for agricultural sprays, etc.
Emcol H-50A	Emulsol Corp.	Fatty acid condensate of polyhydric alcohol.	Emulsifier.	100%	Emulsifier for mineral oil and hcb. oils, etc.
Emcol RDC-D	Emulsol Corp.	Diethylene glycol laurate.	Emulsifying.	100%	Amber liquid. Surface tension of 0.1% sold. 31 dynes/cm.
Emcol RH	Emulsol Corp.	Blend of mono and diglycerides of fatty acids.	Emulsifying.	100%	Edible. Used in foods and pharmaceitucal products.
Emery's A509R Cationic Comp.	Emery Ind.	Quaternary ammonium salt of a fatty acid.	Emulsifying, Wetting.	25%	Textile, deflocculating agent.
Emulfors-ON	General Dyestuff Corp.	Polyethylene ether of long chain fatty alcohol.	Emulsifier.		Emulsifying agent for fats and waxes.
Emulfors-ELA	General Dyestuff Corp.	Polyethylene ether of long chain fatty acid.	Emulsifier.		Emulsifier for animal and vegetable fats and oils. Water-soluble.
Emulfors-AG Oil Soluble	General Dyestuff Corp.	Polyglycol ester of long chain fatty acid.	Emulsifier.		Emulsifier for mineral oils. Fat liquoring of leather.
Emulgor A	Glyco Products Co.		Emulsifier.		Solid, tan wax. Recommended where acid and acid salts are present.
Emulsept	Emulsol Corp.	$CH_3(CH_2)nCOOCH_2CH_2NHCOCH_2N(C_6H_5)$ with Cl	Germicide, Detergent.		A cationic germicide with some detergent properties.
Ethyl Cetab	Rhodes Chemical Co.	Cetyl dimethyl ethyl ammonium bromide.	Germicide, Bactericide.	100%	Cationic, water soluble to 25% if solvent assisted. Pharmaceutical product.
Ethyl Decab	Rhodes Chemical Co.	Octadecenyl-9, dimethyl ethyl ammonium bromide.	Bactericide.		Same as Octinet, only oleic is substituted for stearic. Algaecide and slime preventive.
Foamole-G	Van Dyke and Co.	Fatty alcohol and amide, sulfates and sulfonates.	Detergent, Wetting.	45%	A mixed synthetic suitable for shampoos.
411	Armour and Co.	Sulfonated long chain hydrocarbon.	Detergent, Wetting.	35–40%	Density 10 lbs. cu. ft. Detergency excellent. See also Mercol.
G-917	Atlas Powder Co.	Propylene glycol monolaurate.	Emulsifying.	97–100%	Cosmetics, etc.
G-923	Atlas Powder Co.	Propylene glycol monooleate.	Emulsifying.	97–100%	Cosmetics, etc.
G-924	Atlas Powder Co.	Stearate of above.	Emulsifying.	97–100%	Solid, waxy.
G-930	Atlas Powder Co.	Oleic derivative of a polyhydric alc.	Emulsifying.	97–100%	A water in oil emulsifier.
G-1096	Atlas Powder Co.	Oleic acid derivative of polyoxyethylene sorbitol.	Emulsifying.	97–100%	Oil in water emulsifier.
G-1164	Atlas Powder Co.	Polyoxyalkylene glucose tetrastearate.	Emulsifying.	97–100%	Waxy solid. W/O emulsifying agent.
G-1165	Atlas Powder Co.	Above, using oleic.	Emulsifying.	97–100%	Emulsifying power good. Wetting good. Water insoluble. W/O emulsifier.
G-1425	Atlas Powder Co.	A lanolin derivative.	Emulsifying.	97–100%	Water dispersible for oil in water emulsions.
G-1431	Atlas Powder Co.	A lanolin derivative.	Emulsifying.	97–100%	More water-soluble than above. Same purpose.
G-1441	Atlas Powder Co.	Lanolin derivative.	Emulsifying.	97–100%	Water soluble. As above.
G-1451	Atlas Powder Co.	Lanolin derivative.	Emulsifying.	97–100%	As above. Cosmetics, etc.
G-1493	Atlas Powder Co.	Lanolin derivative.	Emulsifying.	97–100%	Mineral oil soluble.
G-1500	Atlas Powder Co.	Blend of G-1165 and G-2149	Emulsifying.	97–100%	Thin oil.
G-1581	Atlas Powder Co.	A lecithin derivative.	Emulsifying.	97–100%	Water-soluble. Used as emulsifier.
G-2000	Atlas Powder Co.	Mannitan monopalmitate plus polyoxyethylene mannitan monopalmitate.	Emulsifying.	97–100%	Use in polishes, insecticidal sprays, etc.
G-2000	Atlas Powder Co.	Mixture of 45% Span, 40 and 55% of Tween 40.	Emulsifying.	97–100%	Solid waxy.
G-2149	Atlas Powder Co.	Polyoxyethylene stearate.	Emulsifier.	97–100%	Waxy solid, non-ionic as are all these compounds, wetting poor, interfacial tension excellent.
G-2150	Atlas Powder Co.	Polyoxyethylene orppylene glycol monostearate.	Emulsifier.	97–100%	Non-ionic, semi solid, wetting only fair, water-soluble.
G-2151	Atlas Powder Co.	Polyoxethylene stearate.	Emulsifier.	97–100%	Waxy solid, emulsification fair. These series of compounds represent a graduation in emulsification properties by modifying both acid and alcohol chain.
G-2152, G-2153	Atlas Powder Co.	Polyoxyethylene stearate.	Emulsifier.	97–100%	Very similar to above.
G-2160 G-2170	Atlas Powder Co.	Polyoxyethylene propylene glycol stearate (2160), or stearate (2170).	Emulsifier.	97–100%	Non-ionic, semi-solid, interfacial tension of 0.1% sol. against oil is 10.6 dynes/cm. for the stearate and 8.6 for the palmitate.

Trade Name	*Manufacturer*	*Class and Formula*	*Principal Uses*	*Approximate Conc.*	*Remarks*
Gardinol	Gardinol Corp.				This name has been discontinued. See Duponol and Orvus.
Glim (retail and industrial)	General Aniline & Film Corp.	An ethylene oxide condensation product.	Detergent.	83%	Non-ionic, a new retail product in liquid form. Special for dishwashing.
Glycerol monolaurate oleate, monolaurate stearate, monolaurate ricinoleate	Glyco Products Alrose Chem. Kessler Chem. Co., etc.	Same as given.	Emulsifier.	100%	These non-ionic emulsifiers are included here for reference only. None are water-dispersible.
Gobs-o-Suds (retail)	Chem. Mfg. & Distributing Co.	Alkyl aryl sulfonate.	Detergent.		Packed in 16 oz. cartons.
Halo (retail)	Colgate-Palmolive-Peet Co.	Sulfate of mixed fatty acid mono glyceride. Possibly the ammonium salt.	Detergent.		Shampoo.
Igepal CA	General Dyestuff Corp.	Polymerized ethylene oxide condensation product.	Detergent, Wetting.		Unusual property is that of losing its wetting ability when dried on fabric.
Igepon AP	General Dyestuff Corp.	Sod. sulfonate comp. of the oleic acid ester of an aliphatic compound.	Detergent, Dispersing.		See U. S. Pat. 1,881,172 pH of a 10% sol. 7.6 .Stable to acid, alk, and hard water.
Igepon T	General Dyestuff Corp.	A substituted amide $C_{17}H_{33}CON(CH_3)C_2H_4SO_3Na$	Detergent.		A tauride derivative.
Indrawat	Industrial Raw Materials Corp.	Alkyl aryl sulfonate.	Detergent.	90%	Single alkyl side chain of C_9 min. High detergency.
Integritol	Hart Harrington, Inc.	A sulfonated alkylated benzene.	Wetting, Penetrating		Alkyl chain is below C_8. Use: Paints, textiles, leathers.
Intracol Regular, -OA, -O	Synthetic Chemicals, Inc.	Long chain fatty acid amide containing multiple amino groups.	Wetting, Dispersing.		Textiles, rubber, pigments, etc.
Intral 224	Synthetic Chemicals, Inc.	Sat. long chain fatty acid ester containing multiple ether linkages.	Wetting, Dispersing, Emulsifying.		Non-ionic. Not compatible with organic salts or electrolytes.
Intral 433	Synthetic Chemicals, Inc.	Sat. long chain fatty acid ester containing multiple ether linkages.	Wetting, Dispersing, Emulsifying.		Non-ionic. Not compatible with organic salts or electrolytes.
Intral 384	Synthetic Chemicals, Inc.	Sat. long chain fatty acid ester containing multiple ether linkages.	Wetting, Dispersing, Emulsifying.		Amber liquid, water-soluble.
Intramine WK	Synthetic Chemicals, Inc.	Sod. salt of sulfated lorol and myristyl collamide.	Detergent, Wetting.		Water-soluble. Used in textile, metal cleaning, rubber, shampoos.
Intramine Y	Synthetic Chemicals, Inc.	Sod. salt of sulfated lorol and myristyl collamide.	Detergent, Wetting.		Water-soluble. Used in textile, and metal cleaning, rubber, shampoos.
Invadine B	Ciba Co.	Alkyl phenylene sod. sulfonate.	Wetting.		Use: Textiles (for bleaching and carbonizing.
Invadine C	Ciba Co.		Wetting.		
Janusol	Synthetic Chemicals, Inc.	Mixture of lauryl and myristyl esters containing both primary amino and sulfated groups.	Dispersing.		Tan paste.
KEMulsion Series Base AA Base D Base PM Base CC	Kem Products Co.	Probably the fatty acid ester of a poly alcohol.	Emulsion.		These are non-ionic liquid emulsifiers.
Kamenol D	Kamen Soap Products Co.	Sod. salt of a sulfonated oil.	Detergent.		Excellent detergency.
Katapol-CNF Conc.	General Dyestuff Corp.	Salt of a polyethylene ether of a fatty amine.	Detergent.		Neutral or acid wool scouring. Cationic.
KF-100	Up-State Chemical Co.	Amine condensation product.	Detergent.		
Kiersist	Alrose Chemical Co.		Detergent.		Textile, kier boiling.
Kreelon 4D Kreelon 4G	Wyandotte Chemicals Corp.	Alkyl aryl sulfonate.	Detergent.	40%	Flake form. Conforms to type in detergency and wetting. 4G refers to powder form.
Kreelon 7D	Wyandotte Chemicals Corp.	Alkyl aryl sulfonate.	Detergent, Wetting.	65%	Above only in more concentrated form.
Lanitol-F Lanitol-S	Arkansas Co.	Sod. alkyl aryl sulfonate.	Detergent, Wetting		Lanitol S same plus an alkaline salt.
Leonil-SA	General Dyestuff Corp.	Alkyl naphthalene sulfonate.	Detergent.		Textile, levelling agent for acid dyes.
Leonil-O	General Dyestuff Corp.	Alkyl polyethylene ether.	Detergent.		Nonionic. Degreasing agent for wool.
Lightning Penetrator XW	Commonwealth Color & Chemical	Salt of a sulfated higher alcohol.	Wetting, Penetrant.		Textile.
Lipal 450	E. F. Drew & Co.	A fatty acid ester of a polyether alcohol.	Wetting, Foaming.	98%	A nonionic wetting and foaming agent.
Lomar PW	Jacques Wolf & Co.	Sulfonated naphthalene condensate.	Dispersing.		Pigments. New name for Ramol PW.
Lorridol	Beacon Co.		Detergent.		Shampoo, hair wave solutions, shaving creams, etc.
Lupomin	Jacques Wolf & Co.	Fatty acid amide salt.	Emulsifier.		Textile finishing.
Mapro Degum	Onyx Oil & Chemical Co.	Sulfated fatty alcohol blend.	Detergent.		Textile processing.
Maprofix	Onyx Oil & Chemical Co.	Sulfated fatty alcohol blend.	Detergent.		Textile processing.
Mapromin B	Onyx Oil & Chemical Co.	Sulfated cetyloleyl alcohol.	Detergent.		Textile processing.
Mapromol HSY	Onyx Oil & Chemical Co.	Sulfated oleyl alcohol.	Wetting.		Textile finishing.
Maypon 4C	Maywood Chemical Co.	A protein condensation product.	Detergent, Wetting, Emulsifying.		A lathering shampoo base.
Maypon K	Maywood Chemical Co.	A protein condensation product.	Detergent, Wetting, Emulsifying.		Dyeing and bleaching assistant for textiles. Emulsifying agent for insecticides.
Maypon Super K	Maywood Chemical Co.	A protein condensation product.	Detergent.		Scouring agent. Good detergency.
Merpentine	The Du Pont Co.	Modified alkyl naphthalene sulfonate.	Wetting.		In textile dyeing, etc.
Merpol B	The Du Pont Co.	Modified alcohol sulfate.	Penetrant.		Textile scouring and levelling agent.
Merpol C	The Du Pont Co.	Modified alcohol sulfate.	Penetrant.		Textile scouring and levelling agent.
Michelene DCA	Michel Co.	Sulfated glyceryl amide.	Detergent.		Laundry,textile,Oldname:AframineDCA.
Michelene DL	Michel Co.	Sulfated glyceryl amide.	Detergent.		Textile dye levelling.
Michelene DNI	Michel Co.	Sulfated glyceryl amide.	Detergent.		Nonionic detergent. Textile.
Michelene DS	Michel Co.	Sulfated glyceryl amide.	Wetting.		Scouring and levelling agent.
Miranol CL Conc.	Miranol Chemical Co.	Sulfonated fatty acid derivatives.	Detergent, Wetting.	42%	Used for general cleaners.
Miranol LF Conc.	Miranol Chemical Co.	A polyamine derivative of a sulfonated fatty acid amide.	Detergent, Wetting.	42%	Cosmetics, bubble bath, shampoo.
Miranol OH	Miranol Chemical Co.	Modified lauroyl imidazolene hydroxy acetate.	Detergent, Wetting.	45%	Cationic liquid. Thickener for soap solutions, silver polishes, rug shampoos.
Miranol QCK	Miranol Chemical Co.	Above, only the carbonate.	Wetting.	27%	Non-toxic, cationic, dishwashing, ore floatation, textile dyeing.
Miranol SR	Miranol Chemical Co.	Sulfonated fatty acid amide.	Detergent.	23%	pH of 1% sol. 8.7 non-toxic.
Miranol SS	Miranol Chemical Co.	Sulfonated fatty acid amide.	Detergent.	18%	Above, except for % active. Use: General industrial and household cleaners, cosmetics, textile, paper mills.
Miranol XSD	Miranol Chemical Co.	Above, plus an alky aryl sulfonate.	Detergent.	35%	A heavy duty detergent superior in this respect to the others of the series, except Miranol 45. below, which is same.
Miranol 45	Miranol Chemical Co.	Above, plus an alky aryl sulfonate.	Detergent.	65%	Balance is Sod. sulfate. General heavy duty cleanser. Same as Miranol XSD except for the % active.
Miranol 74	Miranol Chemical Co.	Sulfonated fatty acid amide derivative.	Detergent, Wetting.	20%	Similar to Miranol SS only spray dried to a powder.

Trade Name	Manufacturer	Class and Formula	Principal Uses	Approximate Conc.	Remarks
Miranol T	Miranol Chemical Co.	Sulfonated fatty acid amide plus an alkyl aryl sulfonate.	Detergent.	25%	A spray dried product similar to Miranol 45 and XSD, but with a larger bead.
Mirapon RK Conc.	Miranol Chemical Co.	Sulfonated fatty acid amide, plus an alkyl aryl sulfonate.	Detergent, Wetting.	42%	pH of 1% sol. 7, non-toxic anionic, very water-soluble.
Modinal	The Du Pont Co.				Old name for Duponol D.
Monosulph	Nopco Chemical Co.	Highly sulfonated castor oil.	Penetrant, Emulsifying		Textile dyeing assistant.
Morcowet 469	Morton Chemical Co.	Alkyl naphthalene sulfonate.	Detergent.		Textile.
Morlac	Westvaco Chlorine Products Co.		Detergent.		A compounded cleaner using synthetic wetting agents and alkali. Used in food plants, and dairies.
Morpeloil X-479	Morton Chemical Co.	Sulfonic acid.	Wetting.		Textile acid dyeing, etc.
Morpeloil X-508	Morton Chemical Co.	Sulfonic acid.	Wetting.		Textile acid dyeing, etc.
Morpeltex AG	Morton Chemical Co.	A substituted fatty acid amide sulfonate.	Detergent.		Textile, scouring, softening agent. Very stable.
Morpeltex PM	Morton Chemical Co.	Alkyl naphthalene sulfonate plus, amino condensation products.	Wetting, Detergent.		Textile scouring.
Morpeltex 498	Morton Chemical Co.	Alkyl naphthalene sulfonate plus, amino condensation products.	Wetting, Detergent.		Textiles.
Morpelwet Z		Aliphatic ester sulfate.	Wetting.		Textile, rewetting, softening, dye assistant
MP-189	Du Pont	Hcb. sulfonate.	Detergent, Wetting.	40%	Cream colored powder.
MP-189S	Du Pont	Hcb. sulfonate.	Detergent, Wetting.	40%	Same as above, only in liquid form.
MP-646-S	Du Pont	Hcb. sulfonate.	Detergent, Wetting.		Can be incorporated with soap.
N-25	E. F. Houghton and Co.	Alkylol amine.	Detergent.		Laundry, textile.
Nacconol F	National Aniline Division, Allied Chemical & Dye Corp.	Alkyl aryl sulfonate.	Detergent.		Low water, high organic solvent, solubility.
Nacconol EP	National Aniline Division, Allied Chemical & Dye Corp.	Alkyl aryl sulfonate.	Wetting.		Special for electroplating baths.
Naccolene F	National Aniline Division, Allied Chemical & Dye Corp.	Alkyl aryl sulfonate.	Detergent, Dispersing.		Detergent for use in organic solvents.
Nacconol FSNO	National Aniline Division, Allied Chemical & Dye Corp.	Alkyl aryl sulfonate.	Detergent.		Low taste for cosmetic or personal use.
Nacconol HG	National Aniline Division, Allied Chemical & Dye Corp.	Alkyl aryl sulfonate.	Detergent.		Used in salt water soaps, alkaline mixtures and foaming composition.
Nacconol NR	National Aniline	Alkyl aryl sulfonate R-$C_6H_4SO_3Na$	Detergent, Wetting,	40%	Water solubility, 5% at 15°C, 21% at 100°C. One of best alkyl aryl detergents. Side chain single and long. Surface tension at 0.15% and 25° 33 dynes/cm.
Nacconol NRSF	National Aniline	Alkyl aryl sulfonate R-$C_6H_4SO_3Na$	Detergent, Wetting	90% min.	Above, only more concentrated where high water solubility and foaming are required.
Nacconol NRNO	National Aniline	Alkyl aryl sulfonate R-$C_6H_4SO_3Na$	Detergent, Wetting.		Temporarily discontinued.
Naccosol A	National Aniline	Sod. alkyl naphthalene sulfonate.	Detergent, Wetting.		Solubilizing agent.
Naccotan S	National Aniline	High mol. wt. sulfonate.	Wetting.		Very water soluble, used in tanning chrome leather and for dispersion of solids and tars.
Naxonate G	Wyandotte Chemicals Corp.	Xylene sulfonate sod. salt of.	Wetting, Penetrating.	95%	Useful in extraction due to hydrotropic properties.
Naxonate 4L	Wyandotte Chemicals Corp.	Aqueous solution of above.	Wetting, Penetrating.	40%	Above.
Negamine 142 A	Synthetic Chemicals, Inc.	Amine ester of a long chain fatty acid.	Wetting, Emulsifying.		Cation active.
Nekal A	General Dyestuff Corp.	Sod. alkyl naphthalene sulfonate.	Wetting, Emulsifyipg		Textile, paints. The alkyl group averages C_8.
Nekal BX	General Dyestuff Corp.	Isobutyl naphthalene sod. sulfonate.	Wetting, Emulsifying, Penetrant. Penetrant.	100%	Like Santomerse No. 1, has some effect on checking mold growth on textiles. Very stable, particularly to H_2O_2, $CaCl_2O_2$, etc.
Neomerpin	Du Pont	Derivative of alkyl naphthalene sulfonate.	Wetting, Emulsifying.		Very water-soluble. Stable to weak acids and alkalis.
Neomerpin N	Du Pont	Derivative of alkyl naphthalene sulfonate.	Wetting.		Brown liquid. This is an acid. Water-soluble. Similar to Alkanol B in wetting properties.
Neomerpin O	Du Pont	Alkyl naphthalene sod. sulfonate.			A solution of Neomerpin. Discontinued at present.
Neomerpin V.D.	Du Pont				A solution of Neomerpin with solvent. Also discontinued at present.
Neopen SS	Du Pont	Abietene sod. sulfonate.	Wetting.		Discontinued. Used as agric. spray, textiles, paints.
Neutronyx 330	Onyx Oil & Chemical Corp.	Poly alkyl ether condensate of fatty acids.	Dispersing, Emulsifying.		Non-ionic. Behaves cationically in acid medium, anionic in alkali medium. Use, cosmetics, salt water soap.
Neutronyx 834	Onyx Oil & Chemical Corp.	Fatty acid ester of a polyether alc.	Emulsifying.		Oil in water emulsifier. Water dispersible.
Ninol 400	Ninol Laboratories	Mixed fatty acid alkylolamine condensate.	Detergent, Wetting.		Textiles, laundering, etc.
Ninol 737	Ninol Laboratories	Mixed fatty acid alkyolamine condensate.	Detergent, Wetting.		Textiles, laundering, etc.
NNO	Atlas Powder Co.	Hexitan partial fatty acid ester of lauric acid.	Emulsifying.	100%	A coconut oil derivative. Similar to Span 20, except containing glycerides.
NSAE	Onyx Oil & Chemical Co.	Sod. salt of an alkylated naphthalene sulfonic acid.	Wetting, Emulsifying.		Textile processing, dye levelling, electroplating.
Nonisol 100	Alrose Chemical Co.	Polyoxyalkylene fatty ester.	Wetting.	100%	Non-ionic, water soluble, liquid. Use: cosmetics, textiles, etc.
Nonisol 110	Alrose Chemical Co.	Polyoxyalkylene.	Emulsifier.	100%	Nonionic, textiles, insecticidal sprays.
Nonisol 200	Alrose Chemical Co.	Polyoxyalkylene fatty ester.	Emulsifier.	100%	Liquid, nonionic. Emulsifier, cleaner, insecticide sprays.
Nonisol 210	Alrose Chemical Co.	Polyoxyalkylene di-fatty esters.	Emulsifier.	100%	Nonionic, insecticidal sprays, textile oils.
Nonisol 300	Alrose Chemical Co.	Polyoxyalkylene di-fatty esters.	Emulsifier.	100%	Emulsifier, starch stabilizer, thickener.
Nonisol 310	Alrose Chemical Co.	Polyoxyalkylene di-fatty ester.	Emulsifier.	100%	Mineral oil emulsions.
Nopalcol 4-L	Nopco Chemical Co.	Ethylene oxide condensate of a fatty nucleus.	Emulsifier.		Nonionic, various.
Nopalcol 6-0	Nopco Chemical Co.	Ethylene oxide condensate of a fatty nucleus.	Emulsifier.		Nonionic. Textile dyeing assistant.
Nopco 1067	Nopco Chemical Co.	Alkyl aromatic sulfonate.	Detergent.		Textiles.
Nopco 1087X	Nopco Chemical Co.	Sulfonated alkylated aromatic.	Wetting.		Various.
Nopco 1179-R	Nopco Chemical Co.	Fatty amino compound.	Detergent.		Textiles.
Nopco 1408	Nopco Chemical Co.	Sulfated castor oil soap.	Emulsifying, Penetrant.		Various.
Nopco 1086B, 1807C, 1920X, 1967, CVT and DID	Nopco Chemical Co.				Discontinued.

Trade Name	*Manufacturer*	*Class and Formula*	*Principal Uses*	*Approximate Conc.*	*Remarks*
Nopc0 2o31	Nopco Chemical Co.	Sulfated hydroxy stearic acid.	Emulsifying, Penetrant.		Liquid, textiles.
Nopco 2272-R	Nopco Chemical Co.	Sulfated fatty ester.	Wetting.		Various.
Nopcogen 18-L	Nopco Chemical Co.	Coconut amine.	Penetrant.		Textiles.
Nopcogen 16-S	Nopco Chemical Co.	Stearic amine.	Penetrant.		Textiles-cationic, rayon softener.
Nopcogen 20-O	Nopco Chemical Co.	Oleic amine.	Wetting.		Asphalt wetting agent.
Novonacco	National Aniline	Mod. sod. alkyl naphthalene sulfonate.	Wetting.		Textiles.
Novonacco KH	National Aniline	Acid of above.	Wetting.		Textile, carbonizing.
Nullapon-A	General Dyestuff Corp.	A methylene carboxylate derivative.	Dispersing.		Non-ionic, used as a lime soap solvent.
Nullapon-B					The B type is also resistant to certain heavy metals.
Nytron	Solvay Process Co.	Complex alkyl sod. sulfonate.	Detergent, Wetting.	35%	General detergent for household and industrial purposes.
Octab	Rhodes Chemical Co.	Octadecyl dimethyl benzyl amm. chloride $C_{18}H_{37}(CH_3)_2N(C_6H_5)Cl$	Germicide, Wetting.	100%	Cationic. See also Arquad-16 for closely similar compound.
Octab C	Rhodes Chemical Co.	Above.	Germicide, Wetting.	100%	Solid. Discontinued.
Octab CT	Rhodes Chemical Co.	Above.	Germicide, Wetting.	100%	Discontinued.
Octinet	Rhodes Chemical Co.	Octadecyl dimethyl ethyl amm. bromide.	Germicide, Wetting.		Fungicide.
Ondal A	The Du Pont Co.	Blended product.	Dispersing.		An oxidizing agent with dispersing properties.
Onyxsan AD, LG, HSB, O, S	Onyx Oil & Chemical Co.	Complex organic amido derivative.	Wetting, Dispersing.		Textiles, leather. Processing and finishing.
Oranap	Jacques Wolf & Co.	Alkyl naphthalene sod. sulfonate.	Detergent, Wetting.		Textile.
Oratol	Jacques Wolf & Co.	Sulfonated amide.	Detergent, Wetting.		Textile.
Oratol L-48	Jacques Wolf & Co.	Sod. salt of a sulfo ester of a fatty alkanol-amide.	Detergent, Wetting.		Anionic, textiles.
Oronite	Oronite Chemical Co.	Alkyl aryl sulfonate.	Wetting, Emulsifying.	65%	Emulsifier for oils, water-insoluble, oil-soluble.
Oronite No. 3	Oronite Chemical Co.	Alkyl aryl sulfonate.	Detergent, Wetting.	75%	Soluble in water up to 50%. Insoluble in mineral oil.
Oronite No. 4	Oronite Chemical Co.	Alkyl aryl sulfonate.	Detergent, Wetting.	30%	Soluble in water up to 30%. Partly mineral oil-soluble.
Oronite No. 5	Oronite Chemical Co.	Alkyl aryl sulfonate.	Wetting, Penetrating.	29%	Water-dispersible. Hcb.-soluble.
Oronite No. 6	Oronite Chemical Co.	Benzene sulfonate.	Wetting.	52%	Water-soluble, oil-insoluble.
Oroset L	Onyx Oil & Chemical Co.	An alcohol sulfate derivative.	Detergent, Wetting.		Discontinued.
Orthocen K	Am. Aniline and Extract Co.	Soluble sulfonated cresylic acid product.	Wetting, Penetrating.		Textile.
Orvus WA	Procter and Gamble Co.	Sod. salt of tech. loral sulfate.	Detergent, Wetting.		General cleaner.
PD Powder	Eavenson Chemical Co.	Sod. salt of a sulfonated fatty acid amide.	Detergent.	15%	General cleaning agent. Possibly similar to Arctic Syntex T and RN-600, etc.
Penequick	L. Sonneborn & Son	Sulfonated ester.	Wetting, Penetrating.		Textiles-as softening agent.
Penetrant 60	Beacon Co.	Sod. and pot. salts of sulfonated esters of dicarboxylic acids.	Wetting, Penetrating.		Paper, textiles, leather.
Penetrant 65	Beacon Co.				Not available at present time.
Penetrolin AC	Arkansas Co.	Alkyl naphthalene sod. sulfonate.	Wetting.		Textile, leather.
Pensal-O	Pennsylvania Salt Mfg. Co.		Detergent.		Anionic powder. A compounded detergent for industrial trade.
Pentamul 6	Heyden Chemical Corp.	Pentaerythritol monostrearate.	Emulsifying.		
Pentamul 9	Heyden Chemical Corp.	Above, only mono caprate.	Emulsifying.		
Pentamul 87	Heyden Chemical Corp.	Above using mono esters of soya bean fatty acids.	Emulsifying.		Acid and alkali stability poor.
Pentamul 88	Heyden Chemical Corp.	Above, with mono-laurate.	Emulsifying.		
Pentamul 126	Heyden Chemical Corp.	Above, with mono-oleate.	Emulsifying.		No effect physiologically. Recommended for creams, etc.
Pentamul 126S	Heyden Chemical Corp.	Above.	Emulsifying.		An added ingredient, such as soap possibly, to make self-emulsifying.
Pentamull 145	Heyden Chemical Corp.	See Pentamull No. 6			
Pentamull 147	Heyden Chemical Corp.	See Pentamull No. 88.			
Pentamull 149	Heyden Chemical Corp.	See Pentamull No. 9.			
pHisoJerm	Winthrop-Stearns, Inc.	Sulfonated ether and emollients.	Detergent.		A fluid cream type detergent for special medical purposes. Hypo-allergenic.
Phi-H-Sol WA	Onyx Oil & Chemical Co.	A sulfated ester of a fatty acid.	Wetting, Penetrating.		A carboxylic acid ester sulfate. See Pat. 2032314.
Polyethyelene glycol esters of fatty acids	Glyco Products	As given.	Emulsifying.	100%	Not a trade name product, but given here for reference.
Quaker Dianol-G	Quaker Chemical Products Corp.	Fatty acid amide.	Detergent, Wetting.		Industrial cleaners.
Quaker Dianol-N -S -SXC	Quaker Chemical Products Corp.	Fatty acid amide sulfate.	Detergent.		Industrial cleaners.
Quaker Dianol-11	Quaker Chemical Products Corp.	Alkyl aryl sulfonate.	Wetting.		Industrial cleaners.
Quaker Dianol-20	Quaker Chemical Products Corp.	Ester sulfate.	Wetting.		Industrial cleaners.
Quakester 437	Quaker Chemical Products Corp.	Complex glycol ester.	Detergent.		Industrial cleaners.
Quakester 589	Quaker Chemical Products Corp.	Complex glycol ester.	Wetting. Detergent.		Industrial cleaners.
Quix	E. F. Drew	Sulfated fatty acid amides.	Wetting.		Paper, textile, leather.
Quixite	E. F. Drew	Sulfated fatty acid amides.	Detergent.		Textile, leather.
Ramol PW	Jacques Wolf & Co.	Sulfonated naphthalene condensate.	Dispersing.		Pigments. Discontinued. See Lomar-PW.
Resolin B	Sandoz Chemical Co.	Substituted hydrocarbon.	Wetting.		Textiles.
Resonin NF	Sandoz Chemical Co.	Substituted hydrocarbon.	Wetting.		Leather.
Rinfors S	Sandoz Chemical Co.		Detergent.		Textile.
Rinsynol 50L	Alrose Chemical Co.	Alkyl naphthalene sulfonate.	Detergent, Wetting.	43%	Textiles: sulfur dyeing, rewetting, etc.
RN-Sol No. 1	Riches-Nelson Co.	An ester.	Wetting.	100%	Liquid, non-ionic thickening agent.
RN-Sol No. 2	Riches-Nelson Co.		Emulsifying.	100%	Some detergency. Recommended for DDT solutions.
RN Gel-	Riches-Nelson Co.		Wetting, Detergent.	17%	Cosmetics, textile dyeing, boil-eff, etc.
RN-20-L	Riches-Nelson Co.	Alkyl aryl sulfonate.	Detergent, Wetting.		Not recommended in presence of heavy metals.
RN-31	Riches-Nelson Co.	Modified alcohol sulfate.	Detergent, Wetting.	31%	pH neutral, compared to Dreft, except for active strength.
RN-35	Riches-Nelson Co.	Alkyl aryl sulfonate.	Detergent, Wetting.	35%	Domestic and ind. cleaners.
RN-100	Riches-Nelson Co.	Modified alcohol sulfate.	Detergent, Wetting.	15%	Domestic and ind. cleaners.
RN-200 Powder	Riches-Nelson Co.	Alkyl aryl sulfonate.	Wetting. Detergent,	75%	Water spreader for fires, ind. cleaners, pickling baths.
RN-200A Paste	Riches-Nelson Co.	Above.	Detergent, Wetting.	66%	Same as above, only in less active strength.

Trade Name	*Manufacturer*	*Class and Formula*	*Principal Uses*	*Approximate Conc.*	*Remarks*
RN-600	Riches-Nelson Co.	Fatty amide derivative.	Detergent.	87%	General cleaners.
RN 700 Paste	Riches-Nelson Co.	Sod. salt of a sec. alcohol sulfate.	Detergent.	63%	Alkali cleaners, cosmetics.
Rodalon	Rhodes Chemical Co.	Alkyl dimethyl benzyl amm. chloride.	Germicide.	100%	See Octab. which is the longer chain derivative. Uses, disinfectant solution for dairy, restaurants, etc.
Sandev Detergex	Eavenson Chem.	Alkyl aryl sulfonate.	Detergent.	40%	Anionic, white beads. Detergency excellent Contains phosphates.
Sandopan A	Sandoz. Chemical Co.		Detergent.		Textile.
Sandozol N	Sandoz. Chemical Co.		Wetting.		Textile.
Santol S	Charlotte Chemical Labs.		Wetting.		Textile.
Santomerse No. 1	Monsanto Chemical Co.	Alkyl aryl sulfonate.	Detergent.	40%	Side chain is long, detergency excellent.
Santomerse No. 2	Monsanto Chemical Co.	Dodecylbenzene-sulfonate.	Detergent, Wetting.		Discontinued. Same as Santomerse No. 1 with alk. salts.
Santomerse No. 3	Monsanto Chemical Co.	Same as No. 1, except % active.	Detergent, Wetting.	100%	Water-soluble to extent of 15%.
Santomerse No. 43	Monsanto Chemical Co.	Organic amine salt of dodecylbenzene sulfonic acid.	Wetting, Dispersing.		
Santomerse No. 55	Monsanto Chemical Co.	See Santomerse No. 3.	Detergent.	55%	Same as Santomerse No. 3, except for % active.
Santomerse B	Monsanto Chemical Co.	Alkyl ester of an aryl sulfonate.	Detergent.	25%	Designed for use in dentifrices.
Santomerse D	Monsanto Chemical Co.	Decyl benzene sulfonate.	Detergent, Wetting.	100%	Best of Santomerse group for lowering interfacial tension.
Santomerse DT	Monsanto Chemical Co.	N-alkylated alkylene polyamine. $C_{18}H_{35}NH\text{-}C_2H_4NH\text{-}C_2H_4NH_2$	Wetting.	99%	
Santomerse OS	Monsanto Chemical Co.	An amine salt of an alkyl aryl sulfonate.			A new product.
Santomerse S	Monsanto Chemical Co.	Alkyl aryl sulfonate.	Detergent, Wetting.	30%	Water solution of Santomerse D.
Santomerse TIB	Monsanto Chemical Co.	Alkenyl carboxylate.	Wetting.	99%	A new product.
Sapamine KWC	Ciba Co.	Diethyl aminoethyl oleyl amide acetate.	Detergent.	99%	Textiles.
Sapamine MS	Ciba Co.	Quaternary ammonium compound.	Wetting.		Will exhaust on textiles because of affinity for same (cationic).
Sellogen ASD Cons.	Jacques Wolf & Co.	Sod. alkyl naphthalene sulfonate.	Detergent, Wetting.		General cleanser.
Sellogen C	Jacques Wolf & Co.	Higher alcohol ester compound.	Detergent, Lubricant.		Textiles.
Sitol Flakes	Du Pont	Sod. salt of M-nitro-benzene sulfonic acid.	Wetting.		Mild positive oxidizing action in presence of reducing agents.
Soap of Phenyl Quanidine	American Cyanamid Co.	As given.	Emulsifier.	95%	Anionic. oil in water, emulsifier.
Soapotol	Commonwealth Color and Chemical Co.	Salt of a sulfonated fatty amide.	Detergent.		Textiles.
Solid LPC	Hooker Electro-Chemical Co.	Laury! pyridinium chloride $C_5H_5N\text{-}C_{12}H_{25}$ (Cl)	Batericide, Germicide.	30%	Liquid, phenol coeff. SA 350. On basis 100% LPC. Cationic.
Soliol Base N60	Oil State Petroleum Co.	Alkyl aryl sulfonate.	Detergent, Wetting, Emulsifying.		
Solvadine AL	Ciba Co.		Wetting.		Textile, leather, paper.
Solvadine BL	Ciba Co.	Sod. salt of alkyl naphthalene sulfonic acid.	Emulsions.		Textiles--kier boiling.
Solvadine NC Conc.	Ciba Co.	Alkyl aryl sulfonate.	Wetting.		General applications.
Solvadine R	Ciba Co.	Aryl alkyl ether sulfate.	Wetting.		Textile.
Solvotex	Alrose Chemical Co.	A low titer soap in solvent.	Wetting, Detergent.		Textile washing.
Sorbit AC	Alrose Chemical Co.	Alkyl naphthalene sulfonate.	Wetting, Emulsifying.	65%	Highly soluble in water and alkalis. Carbonizing, acid cleaners, polymerizations.
Sorbit P	Alrose Chemical Co.	See Sorbit AC.		75%	
Soromine-FW Paste	General Dyestuff Corp.	Sod. sulfonate of synthetic organic ester.	Detergent, Penetrant.		Textile softening agent, scouring agent.
Span 20	Atlas Powder Co.	Sorbitan monolaurate.	Emulsifying.	97–100%	Mfg. by dehydrating hexitol to hexitans and making mono ester. Water insoluble.
Span 40	Atlas Powder Co.	Above, mono palmitate.	Emulsifying	97–100%	Cosmetics, insecticidal sprays, etc.
Span 60	Atlas Powder Co.	Above, only the stearate.	Emulsifying.	97–100%	Cosmetics. food emulsifier.
Span 65	Atlas Powder Co.	Sorbitan tristearate.	Emulsifying.	97–100%	Cosmetics.
Span 80	Atlas Powder Co.	Sorbitan monoleate.	Emulsifying.	97–100%	More soluble than the Span 40 and 60. W/O emulsifier.
Span 85	Atlas Powder Co.	Sorbitan trioleate.	Emulsifying.	97–100%	
Stablex A	Heveatex Corp.	Sod. naphthalene sulfonate.	Wetting, Emulsifying.		For latex emulsions.
Stablex C	Heveatex Corp.	Petroleum sulfonates.	Wetting.		For latex emulsions.
Stablex G					
Stearonyx	Onyx Oil & Chemical Co.		Wetting.		Discontinued.
Sulfanole	Warwick Chemical Co.				Discontinued.
Sulfanole KB	Warwick Chemical Co.	Alkyl aryl sulfonate.	Detergent, Wetting.		General cleaners.
Sulframin BLX	Ultra Chemical Works	Sulfated alkylamine.	Detergent.	80%	See Sulframine DT.
Sulframine DH	Ultra Chemical Works		Detergent.		Textile, scouring, dye assistant.
Sulframine DHL	Ultra Chemical Works	Sod. salt of an alkyl amide sulfate.	Detergent.	31%	Water and alc. soluble.
Sulframine DR	Ultra Chemical Works	Alkyl amide, sulfate.	Detergent.		Textile, as levelling agent.
Sulframine DT	Ultra Chemical Works	Sod. salt of an alkylaminosulfate.	Detergent.		Textiles and household.
Sulframine LW	Ultra Chemical Works	Above, with more lauric acid content.	Detergent.		Textile, household and cosmetics.
Sulframine N	Ultra Chemical Works	Sod. salt of di-alkyl naphthalene sulfonic acid.	Wetting.		Non-foaming. Textiles-carbonizing wool, mercerizing cotton.
Supersulphate FS	Laurel Soap Co.	Sulfated aryl alcohol.	Detergent.		
Surfax WO	E. F. Houghton & Co.	Highly sulfated fatty ester.	Wetting.		Textiles, inks, paper.
Surfax TR	E. F. Houghton & Co.	Hydrocarbon sulfonate.	Wetting.		Textiles, inks, paper.
Swerl (retail)	H. J. Heinz Co.	Alkyl aryl sulfonate.	Detergent.		Mfg. by National Aniline and distributed by Heinz. Similar to Nacconol.
Synatol	E. F. Drew & Co.	Fatty acid ester.	Emulsifying.		Non-ionic.
Teel (retail)	Procter and Gamble Co.	Fatty alcohol sulfate	Detergent.		Dentifrice.
Teepol	Shell Refining and Marketing Co. (London)	Secondary sod. alkyl sulfonate.	Detergent, Wetting.		Anionic, powder. Comparable to Mersolates in Germany and Du Pont's MP series.
1011	E. F. Drew	A secondary amide of aluric acid.	Wetting.	100%	
Tenesol	Charlotte Chemical Laboratories		Wetting.		Textiles.
Tensol	Synthetic Chemicals, Inc.	Sulfonated naphthalene alkyl ether.	Wetting.		Textiles, leather, rubber.
Tergitol 08	Carbide & Carbon Chemicals Corp.	Sod. sulphate deriv. of 2-ethyl hexanol-1 $C_4H_9CH\text{-}CH_2SO_4Na$ (C_2H_5)	Wetting, Emulsifying.	38%	Very stable to high electrolyte. Mercerizing penetrant.
Tergitol 4	Carbide & Carbon Chemicals Corp.	7-ethyl-2 methyl-undecanol-4	Wetting, Emulsifying.	25%	Used for emulsion work where salt content is between 1 and 10% of acid content is 3-5%. Carbonizing of wool.
Tergitol 7	Carbide & Carbon Chemicals Corp.	Sod. sulfate derivative of 3, 9-diethyl tridecanol-6	Wetting, Emulsifying.	25%	Use where electrolyte is below 1%. Textiles--hypochlorite bleaching of good emulsifier.

Trade Name	*Manufacturer*	*Class and Formula*	*Principal Uses*	*Approximate Conc.*	*Remarks*
Tergitol P-28	Carbide & Carbon Chemicals Corp.	Di (2-ethylhexyl) phosphate.	Wetting, Emulsifying.	25%	Used in kier boiling, textile dyeing.
Tergitol Penetrant 4T	Carbide & Carbon Chemicals Corp.	Triethanolamine derivative of Tergitol 4	Wetting, Dispersing.		Textiles, paint, rubber, cosmetics.
Tetranol 1638	Arkansas Co.	Highly sulfated fatty ester.	Wetting.		Textiles, leather.
Texol	Burchart-Schier Chemical Co.		Detergent, Wetting.		A detergent for the textile trade.
Tide (retail)	Procter & Gamble Co.		Detergent, Wetting.		New product. White powder with very high foam value.
Titadine TA	Titan Chemical Prod.	Mixture of alkyl naphthalene sulfonic acid ester and sulfated alcohol.	Wetting.		Textiles.
Titamine TCP	Titan Chemical Prod.	Derivative of sulfonated alcohol.	Wetting. Emulsifying.		Textiles.
Titan Decitrene	Titan Chemical Co.	Alkylated aromatic sulfonate.	Wetting.		Textiles.
Titanole RMA	Titan Chemical Co.	Alkylated aryl sod. sulfonate.	Wetting.		Textiles.
Titazole SA	Titan Chemical Co.	Sod. alkyl naphthalene sulfonate.	Wetting.		Textiles.
Triton 812, E-40, E-79 K-12, M-25, S-18	Rohm and Haas Co.				Discontinued.
Triton X-30	Rohm and Haas Co.	Alkylated aryl polyether alcohol.	Detergent, Wetting, Emulsifier.	33%	Aqueous solution of Triton X-100(N-100) and acceptable for such applications where an aqueous sol. may be used.
Triton NE See note under Triton X-400					
Triton X-45	Rohm and Haas Co.	Alklylated aryl polyether alcohol.	Emulsifier.	100%	Nonionic liquid emulsifier. Oil soluble, water insoluble. Insecticide and agricultural sprays, form depressant.
Triton X-55 (Triton W-30 See note under Trixton X-400	Rohm and Haas Co.	A sulfonated aromatic ether alcohol.	Wetting, Dispersing, Penetrating.		Cosmetics, textiles.
Triton X-100 (Triton N-100 See note under Triton X-400	Rohm and Haas Co.	Alkylated aryl poly ether alcohol.	Wetting, Detergent, Emulsifying.	100%	Insec. and agri. sprays. Industrial cleaners, fire fighting, paper processing, textiles, etc.
Triton X-120	Rohm and Haas Co.	Alkylated aryl polyether alcohol.	Wetting, Dispersing.	40%	Non-ionic powder. In insecticide and agricultural wettable powders.
Triton X-155	Rohm and Haas Co.	Dimeric alkylated aryl polyether alcohol.	Wetting, Dispersing.		Nonionic liquid. Oil and water soluble. Insec. and agri. sprays; emulsifier; rubber processing.
Triton X-166	Rohm and Haas Co.	Alkylated aryl polyether alcohol.	Wetting.	12½%	Nonionic powder. Insec. sprays, etc.
Triton X-200 (Triton 720 See note under Triton X-400)	Rohm and Haas Co.	Sod. salt of alkylated aryl polyether sulfonate.	Detergent, Wetting.	28%	Anionic liquid, cosmetics, household cleaners, rubber processing.
Triton X-300 (Triton 770 See note under Triton X-400)	Rohm and Haas Co.	Sod. salt of alkylated aryl polyether sulfonate.	Detergent, Wetting, Penetrant.	30%	Household and industrial cleaners; fire fighting; metal and paper processing. Contains 22½% isopropanol.
Triton X-301 Triton 773	Rohm and Haas Co.	Same as Triton X-300.	Detergent.	20%	Cosmetic, household and industrial cleaners.
Triton X-400 Triton K-60	Rohm and Haas Co.	Cetyl dimethyl benzyl ammonium chloride.	Emulsifier, Wetting.	25%	Cationic paste. Hair rinse, emulsions for industrial use, rubber compounding, textile softener. Where a Triton bears two designations, the X refers to the Agric. and Sanitary Chemicals Dept. The alternate designation is used by other departments.
Triton X-500 Conc. Triton W-30 Conc.	Rohm and Haas Co.	Sod. salt of alkylated aryl poly ether alcohol.	Wetting. Penetrating.	27%	Contains 27% isopropanol. Anionic liquid levelling agent for waxes, polishes, textiles, rubber compounding.
Triton B-1956	Rohm and Haas Co.	Phthalic glycerol alkyd resin.	Emulsifier.	100%	Nonionic, liquid emulsifier. Oil and water-soluble.
Triton C-50	Rohm and Haas Co.	Alkylated aryl polyether alcohol.	Detergent, Wetting.	15%	Nonionic, liquid. Textile scouring.
Tween 20	Atlas Powder Co.	Sorbitan monolaurate polyoxyethylene derivative.	Emulsifying.	97–100%	Water soluble. See also G- series.
Tween 40	Atlas Powder Co.	Monopalmitate of above.	Emulsifying	97–100%	Water soluble. See also G- series.
Tween 60	Atlas Powder Co.	Monostearate of above.	Emulsifying.	97–100%	Less hydrophilic than Tween 20 or 40.
Tween 61	Atlas Powder Co.	Monostearate of above.	Emulsifying.	97–100%	The polyethylene condensate has a shorter chain than Tween 60 and is less water-soluble.
Tween 65	Atlas Powder Co.	Sorbitan Tristearate. Polyoxyethylene derivative.	Emulsifying.	97–100%	Water-dispersible.
Tween 80	Atlas Powder Co.	The monooleate of sorbitan polyoxyethylene derivative.	Emulsifying.	97–100%	Oily liquid. Resembles Tween 20 in solubility.
Tween 81	Atlas Powder Co.	Similar to Tween 61. Shorter side chain.	Emulsifying.	97–100%	Water dispersible.
Tween 85	Atlas Powder Co.	The trioleate of sorbitan polyoxyethylene derivative.	Emulsifying.	97–100%	Less water soluble than Tween 80, more soluble than Span 85.
Twitchell Oils E466R E476R	Emery Industries, Inc.	Sulfated fatty acid derivative.	Emulsifying.	97–100%	Nonionic, liquid. Use for replacement of sulfonated olive and castor oils.
Turco Acidose	Turco Products, Inc.	Alkyl aryl sulfonate.	Detergent, Wetting.		
Ultrapone DL	Ultra Chemical Works	Amine condensate.	Emulsifying.		Water dispersible. Oil and water emulsifier.
Ultrapon S	Ultra Chemical Works	Amine condensate.	Detergent, Emulsifier.	97–100%	Textile, cosmetics, household.
Ultrawet 40	Atlantic Refining Co.	Alkyl aryl sulfonate R′, R″, R‴ $C_6H_5SO_3Na$	Wetting, Detergent.		R′, R″ and R‴ are very short alkyl chains. Discontinued.
Ultrawet E	Atlantic Refining Co.	Alkyl aryl sulfonate.	Detergent.		
Unitex	Commonwealth Color and Chemical Co.	Sod. salt of alkylate aromatic sulfonate.	Detergent, Wetting.		Textiles.
Vel (retail)	Colgate-Palmolive-Peet	The ammonium salt of a sulfated monoglyceride.	Detergent, Wetting.		See also Glim, Tide, All, Breeze for other retail products.
Victamine-C	Victor Chemical Works	Substituted amide of alkyl phosphate.	Emulsifying.		Textile, alkyl group -C_{18}.
Victamine-D	Victor Chemical Works	Above, with alkyl group 18.	Emulsifying.		Textiles.
Victawet-35B	Victor Chemical Works	Phosphorated higher alcohols $(Octyl)_8Na_3P_8O_{28}$	Wetting, Penetrating.		Textiles.
Victawet-58B	Victor Chemical Works	$(Capryl)_8Na_8P_8O_3$	Wetting.		
Warco A-97	Warwick Chemical Co.				
Warco A-141	Warwick Chemical Co.		Detergent, Wetting.		Non-ionic, liquid.
Warcofix	Warwick Chemical Co.	Quaternary amm. compound.	Wetting.		Reduces textile bleeding.
Warcosan	Warwick Chemical Co.	Sulfated ester.	Wetting.		
Warcosol-60S	Warwick Chemical Co.	Alkyl naphthalene sod. sulfonate.	Wetting.		Textiles.
Warcosol 897A	Warwick Chemical Co.	Long chain alkyl aryl sod. sulfonate.	Wetting.		Textiles.
Warcowet A	Warwick Chemical Co.		Wetting.		Poor foaming. Very stable in acid and alkali.
Wetanol	Glyco Products Co.	Mod. sod. salt of sulfated fatty alcohol.	Penetrating, Wetting.		General purpose for creams, leather, paper, etc.
Wetsit	Jacques Wolf & Co.	Alkylated aromatic sulfonate.	Wetting, Penetrating.		Textiles, paper.
Wetsyn	E. F. Drew Co.	A secondary amide of lauric acid.	Detergent, Wetting.	30%	Good lathering. Viscosity is maintained on dilution.
Xynomine	Onyx Oil & Chemical Co.	Sulfonated fatty acid condensate.	Detergent, Wetting.		Textile processing, household detergent.

THE CHEMICAL PANORAMA

NEWS OF THE CHEMICAL PROCESS INDUSTRIES IN PICTURES

PEOPLE

Carl and Gerty Cori, noted Czech-American biochemists, who, with Dr. B. A. Houssay of Buenos Aires, have been awarded the Nobel prize in medicine for work on animal starch.

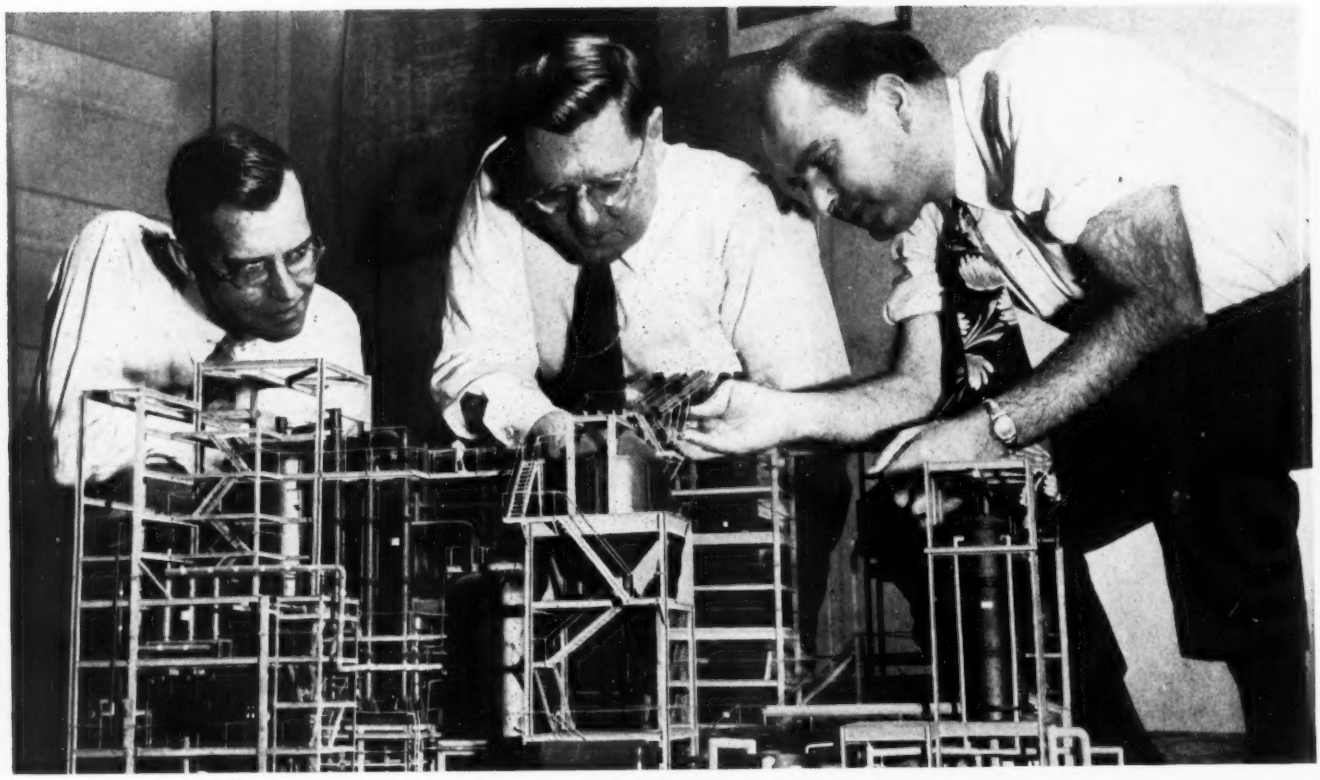
William H. Winfield, appointed manager, Dept. of Economic Research, Monsanto Chemical Company.

Ray Sanders, named general manager, Chlorine Solutions and the Pacific Chemical Co.

Ernest Hart, elected president, Niagara Sprayer and Chemical Div., Food Machinery Corp.

Roman Chelminski, who has joined Knowles Associates as a general partner. He was formerly with the Process Div., General American Transportation Corp.

Robert S. Long, made assistant director of organics, of research dept., Calco Chemical Div., American Cyanamid Co.



Engineers Jim Hallett, Bob Stewart and Norm Copeland inspect scale model of a new plant.

Cutting Process Costs Engineers' Prime Objective

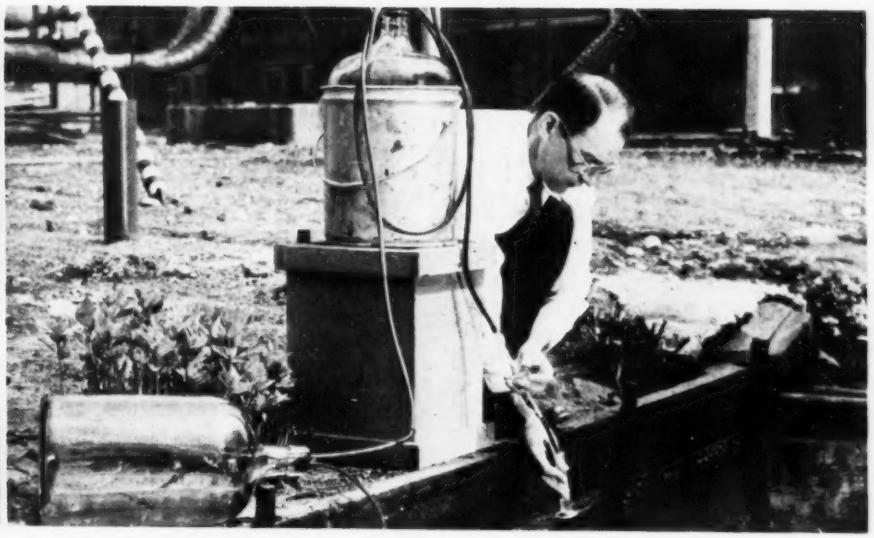
Engineers at a chemical plant do not—notwithstanding the suspicions of most chemists—always rush from job to job with a kit of plumbing tools. On the other hand, engineers are called upon to perform a diversity of tasks in 150 different fields of specialization. Much of the work done by Du Pont's Engineering Department, some operations of which are shown on these pages, is not directly related to new plants. A great deal of it, rather, is devoted to the investigation of new methods, new materials, new processes—with an eye to cutting costs of new and existing products by increasing efficiency. Plant engineers, research engineers and engineering consultants all work together with research departments as a team.

Materials handling consultant Fred Miller worries about efficient handling of raw materials, intermediates and finished chemical products.

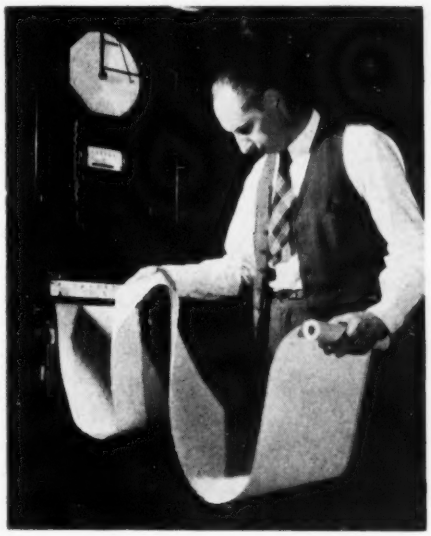
Norm Nielsen uses a "Sonigage" to determine the thickness of a vessel wall. This instrument uses sound waves.

Combustion consultant Ralph Hibner examines a furnace. Long experienced in coal and oil, he advises plant men on most efficient combustion techniques.

Engineer Morris Silverman watches machinist working on a Mechanical Laboratory project.



Waste disposal consultant Lyman Cox tells how to salvage usable by-products and avoid stream pollution. Here he is adjusting a device which collects water samples from a plantside stream.



Instrumentation consultant Joe Vaytilla examines controls, which boost quality and safety.

Lubrication consultant Al Strohmaier studies a lubricant. He maintains a company code system.

Container consultant Phil Kennedy evaluates new packages. First study saved $250,000 a year.

Engineer Charlie Putney examines camphor block in connection with a wrapping problem. Answers to such industrial engineering questions are key to increased production, product betterment.

Soil mechanics engineer Fred Klauck breaks up soil from a prospective plant site for testing.

CI Exhibits At Pacific Show

Chemical Industries exhibited over 500 "New Chemicals For Industry" at the first Pacific Chemical Exposition, in San Francisco Civic Auditorium, October 21-25. They will also be displayed in New York December 1-6, at the 21st Exposition of Chemical Industries, Grand Central Palace. Highlight of the Pacific exhibit was a special display, arranged with the cooperation of Monsanto Chemical Co., featuring the most talked-about new products of recent years: radioactive isotopes. These materials are unique products of the atomic age, and they will perform tasks in medicine, biology and fundamental research impossible to non-radioactive substances.

A. I. Ch. E. Meets In Buffalo

The Western New York Section of the American Institute of Chemical Engineers was host to the Buffalo Regional Meeting September 28-October 1. Among those seen at the meeting were (top, left to right) W. J. Mitchell, the Du Pont Co.; C. W. McConnel, Linde Air Products Co.; D. F. Othmer, Polytechnic Institute of Brooklyn; and M. J. P. Bogart, Lummus Co. Mr. Mitchell was chairman of the Public Relations Committee. Immediately to the right (left to right) are W. M. Humphrey, National Aniline Division; Fred Olson, Olin Industries; and R. L. Murray, Hooker Electrochemical Co., who was chairman of the General Committee. At the right, below (top to bottom) are E. R. Riegel, University of Buffalo; and E. K. Beverly, National Aniline Division. Dr. Riegel was chairman of the Program and Papers Committee. Directly below are L. M. White, consultant, Fiscal Committee chairman; and R. M. Crawford, Durez Plastics & Chemicals, Inc., chairman of the Western New York Section.

FROM THE DOW LIBRARY OF SPECIAL CHEMICALS

Dowanol 33B

(propylene glycol methyl ether)

(1-methoxy-2-propanol)

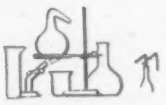
Dowanol 50B

(dipropylene glycol methyl ether)

Dowanol 62B

(tripropylene glycol methyl ether)

Commercially Available



The interesting properties of these glycol ethers indicate their probable value as constituents of hydraulic fluids; as solvents for lacquers, dyes and a variety of other materials; and as intermediates for the production of esters for solvent and plasticizer uses. For further information and samples, just write or telephone the Dow office nearest you.

THE DOW CHEMICAL COMPANY • MIDLAND, MICHIGAN

New York • Boston • Philadelphia • Washington • Cleveland • Detroit • Chicago
St. Louis • Houston • San Francisco • Los Angeles • Seattle
Dow Chemical of Canada, Limited, Toronto, Ontario

CHEMICAL COMMENTS

Jacketed Kettles that Cook with Dowtherm

Multipurpose kettles constructed for the laboratory or semiplant use Dowtherm, a heat transfer medium developed by Dow. Such kettles are built with the jacket bottom enlarged to accommodate a small quantity of water, Dowtherm E or Dowtherm A. This pool of liquid can be heated with electric or gas heat to provide vapor for heating the kettle. The unit is operable at temperatures ranging from 200° F. to 700° F., with corresponding pressures not exceeding 125 pounds per square inch.

A Flavor that Checks Mold

One of the "specialties" manufactured by our Aromatics Division has been found to have dual utility. The product, called Palatone (Trade Mark) has found wide use as an intensifier in berry flavors and as a sweetener in chocolate products. On the basis of experiments recently completed by Dow's Biochemical Research Laboratory, it has been shown to be an effective fungistat also, even in the small concentrations at which it is used as a flavor constituent.

Dow Glycols Enter the Electrical Field

The five Dow Industrial Glycols, products of many-sided importance to a variety of industries, have extended their usefulness in the past few years into the electrical field. Modern small dry electrolytic radio condensers are made possible by virtue of the fact that glycols will dissolve appreciable quantities of boric acid. Diethylene Glycol is used successfully for this purpose, as it rates high as a nonvolatile conductor that does not corrode aluminum.

DOW

CHEMICALS INDISPENSABLE
TO INDUSTRY AND AGRICULTURE

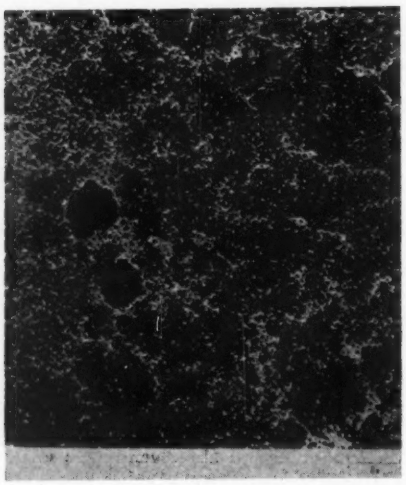
50th Anniversary 1897-1947

NEW PRODUCTS & PROCESSES

Colloidal Silica NP 556

"Ludox" colloidal silica, a fluid, opalescent aqueous dispersion containing the elements of common sand in a relatively high state of purity and in a finely divided form has been put on the market by E. I. du Pont de Nemours & Co.

Until recently, commercial silica sols and gels have been prepared chiefly by the



reaction between aqueous acids and sodium silicate solutions. Sols prepared by this method are high in salt content, making them unsuitable for use in many applications. "Ludox" sols are prepared by a patented process involving the reaction of aqueous sodium silicate with a cation or base exchange resin and are essentially salt and sodium free.

"Ludox" is highly fluid, even in concentrated form, and on drying yields substantially pure silica in the form of thin films or finely divided, discrete particles which cannot be re-dissolved in water. Colloidal solutions of 18% silica concentration are already available, and it is expected that a 30% solution will be ready for distribution early in 1948. Such solutions can be stored indefinitely without any settling or gelation. They can, however, be readily precipitated or gelled, if desired, by the addition of certain salts or organic substances.

The individual particles of silica in "Ludox" are exceedingly small. When dried and examined by means of the electron microscope they are found to have a diameter of less than one-millionth of an inch. In this respect they resemble the finest particles hitherto known, such as the carbon blacks produced by the combustion of natural gas.

"Ludox" affords a means of modifying many other materials to utilize the inherent properties of silica; namely, mechanical strength, resistance to atmospheric and chemical agents, and resistance to heat. These qualities accordingly suggest that it may find wide application in the compounding of rubber, for the surface treatment of paper, in leather dressings, and for numerous other industrial uses.

More Allyl Starch NP 557

Culminating three years of laboratory research, General Mills, Inc., recently began pilot plant production of allyl starch, a versatile newcomer to the protective coating industry. The company is making samples of the new product available to the trade.

Allyl starch has been suggested for uses in products ranging from protective and decorative coatings to thermosetting adhesives. Because it forms glossy, abrasion-resistant films, it appears particularly promising as a lacquer and varnish for furniture. A manufacturing technique has been developed which for the first time makes possible production of allyl starch in quantities large enough for extensive evaluation. In solid form, allyl starch is a yellow-colored material which polymerizes on contact with air. Consequently, it is most conveniently shipped and stored in solution. Generally speaking, it is soluble in alcohols, ketones, esters, halogenated hydrocarbons, nitroparaffins, ethers, benzene and in other aromatic hydrocarbons when some hydrogen bond-forming solvent such as isobutanol is present.

General Mills now offers sample solutions containing from 40 to 45% solids in benzene, lacquer solvent and in 95% xylene-5% isobutanol. Limited quantities of dry allyl starch powder are also available.

The viscosity of these solutions depends largely upon the solvent employed. While a 40% allyl starch solution in a lacquer solvent shows a viscosity of 83 centistokes, a similar solution in 95% xylene-5% isobutanol has a viscosity of 360 centistokes and in benzene, 386 centistokes at 25° C.

To prevent brittleness, allyl starch films must contain from 10 to 20% plasticizer. However, this does not present a serious problem since allyl starch is compatible with Monsanto Santicizers, Wyandotte sulfonamides, phthalate and sebacate esters, phosphate esters, Pittsburgh Plate Glass Co. carbonate esters, numerous abietic acid derivatives, some of the Paraplex resins and certain alkyd resins.

Curing of these films, which may require several weeks at room temperature, can be accelerated by the use of a cobalt drier, and curing time can be cut to one hour or less by baking films at from 130° to 150° C. without a catalyst. Laboratory studies indicate that this baking procedure also improves the water-resistance of the resulting film.

Cationic Type Surface-Active Agents NP 558

A series of cationic surface-active chemicals is now being produced by Nopco Chemical Co. Known under the trade name Nopcogen, these products possess unusual physical and chemical properties, attributed to the combination of fatty nuclei and nitrogenous chemicals.

The higher molecular-weight members of the series show an increasing degree of basicity and have an improved and more complete dispersibility in acid mediums. Some members of the series exhibit complete solubility in waxes, petroleum and vegetable oils, and numerous organic solvents.

A most outstanding property of these surface-active agents is one in which the oil phase of an emulsion is made substantive to cellulose. This property simplifies

CHEMICAL INDUSTRIES TECHNICAL DATA SERVICE

CHEMICAL INDUSTRIES, 522 Fifth Ave., New York 18, N. Y. (11-7)

Please send me more information, if available, on the following items. I understand that nothing further may be available on some of them.

NP 556	NP 559	NP 562	NP 565
NP 557	NP 560	NP 563	NP 566
NP 558	NP 561	NP 564	

(*Please print*)

Name ..... (Position) .....

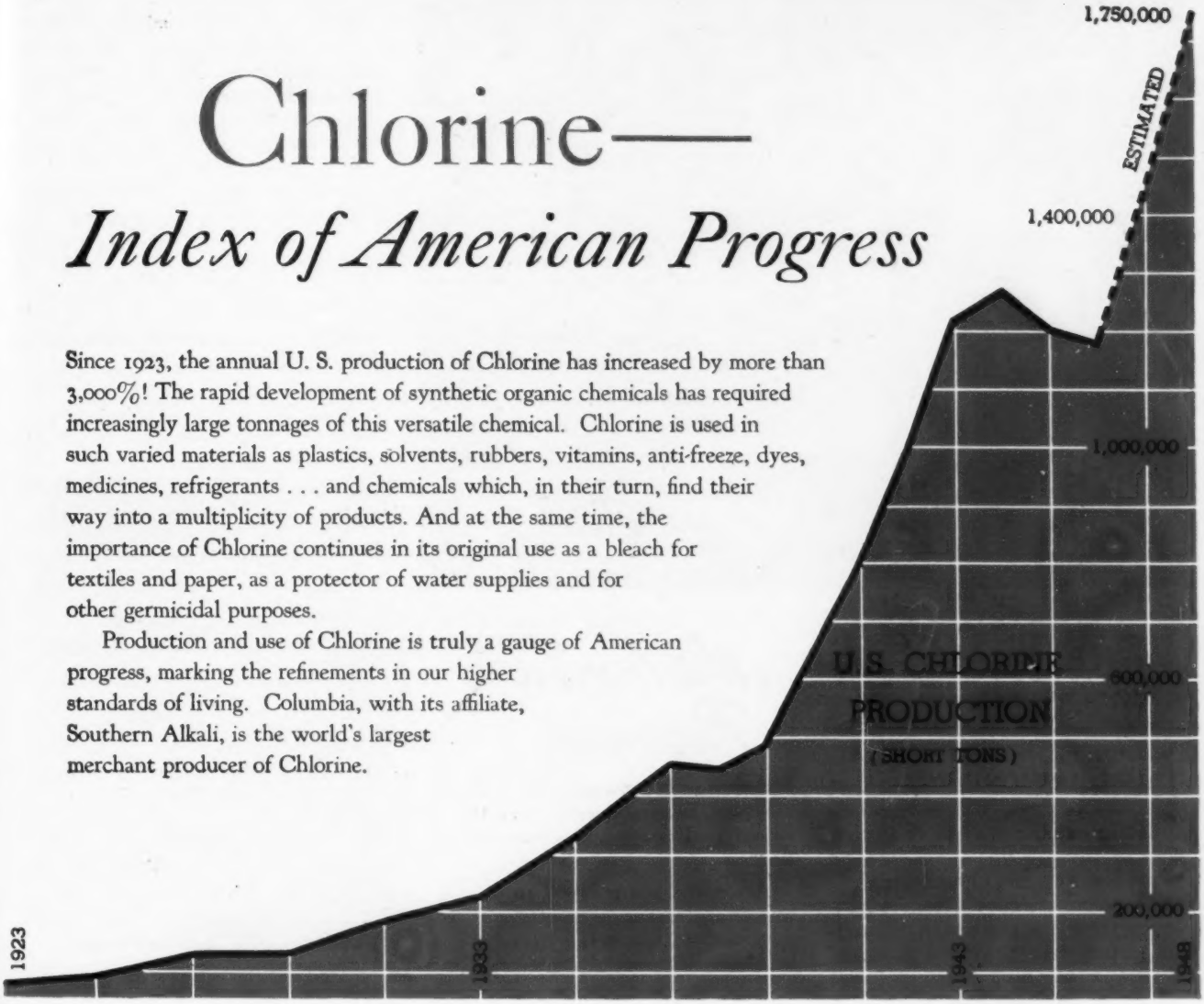
Company .....

Street .....

City..... Zone..... State.....

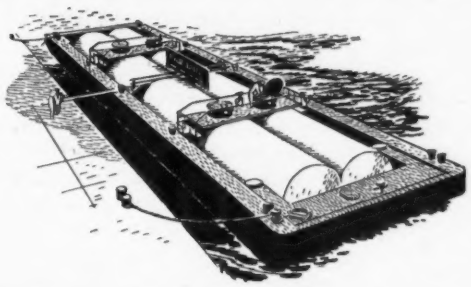
Chlorine—

Index of American Progress

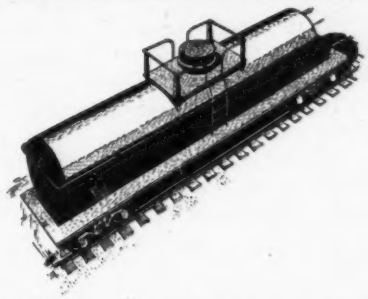


Since 1923, the annual U. S. production of Chlorine has increased by more than 3,000%! The rapid development of synthetic organic chemicals has required increasingly large tonnages of this versatile chemical. Chlorine is used in such varied materials as plastics, solvents, rubbers, vitamins, anti-freeze, dyes, medicines, refrigerants . . . and chemicals which, in their turn, find their way into a multiplicity of products. And at the same time, the importance of Chlorine continues in its original use as a bleach for textiles and paper, as a protector of water supplies and for other germicidal purposes.

Production and use of Chlorine is truly a gauge of American progress, marking the refinements in our higher standards of living. Columbia, with its affiliate, Southern Alkali, is the world's largest merchant producer of Chlorine.



NEW COLUMBIA BARGES offer numerous advantages to large-volume chlorine consumers located along the Ohio-Mississippi waterways. Each barge has a capacity of 600 tons and has many features for safety and simplicity in loading and delivery.



55-TON CHLORINE TANK CARS were first placed in service through Columbia assistance in design. Complete transportation service includes 30-ton single unit tank cars . . . multiple 15 one-ton unit cars and 100 and 150 lb. all-steel cylinders.

PITTSBURGH PLATE GLASS COMPANY, COLUMBIA CHEMICAL DIVISION, FIFTH AVENUE AT BELLEFIELD, PITTSBURGH 13, PA.

Manufacturers of Alkalies and related products, including SODA ASH, CAUSTIC SODA, LIQUID CHLORINE, SODIUM BICARBONATE, CALCIUM CHLORIDE, CAUSTIC ASH, MODIFIED SODAS SODA BRIQUETTES, PHOSFLAKE, CALCENE T, SILENE EF, PITTCHLOR AND PITTCIDE.

COLUMBIA CHEMICALS

PAINT • GLASS • CHEMICALS • BRUSHES • PLASTICS

PITTSBURGH PLATE GLASS COMPANY

AMMONIA ... the Invisible Provider

A BARRETT BASIC CHEMICAL

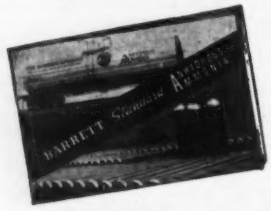
PURE AMMONIA (NH_3) is an invisible gas. But Ammonia's countless contributions to your way of life are visible all around you. Used as a gas, or as a liquid, or as a basic chemical from which other products are made, Ammonia enters into the production of almost everything you eat and wear and use.

Ammonia is the main source of plantfood Nitrogen, *the growth element* in the millions of tons of fertilizers which help American farms to yield a more abundant harvest of food, fiber and vegetable oil. As our chief refrigerant, Ammonia makes ice, quick-freezes or refrigerates perishable foods and air-conditions buildings.

Ammonia is used in the production of water-purifiers, sulfa-drugs, anti-malarials, vitamins and yeast. Derived from Ammonia are basic Nitrogen components of enamel ware, plastics, dyes, dry-cell batteries, industrial explosives, flame-proofing compounds, household cleaners, lacquers, certain types of rayon and other synthetic textile fibers.

Ammonia is a reagent employed in making rubber, high-octane gasoline, leather, industrial alcohol, alkalis, glass and paper. Ammonia serves as a solvent to extract certain metals from their ores. Disassociated Ammonia seals radio tubes and Ammonium fluoride etches glassware and frosts electric light bulbs. The bearings, crankshaft and piston rings of your automobile are hardened in an atmosphere of Ammonia.

Yet all of this is only the beginning. For Ammonia and its compounds and derivatives have literally hundreds of uses which help to provide better living for you and your family. To supply you with the everyday magic of this modern maker of miracles, Barrett, pioneer distributor of Ammonia, continues to expand its facilities and improve its service.



This interesting and helpful booklet is packed with useful information on Anhydrous Ammonia. You can obtain a copy without charge or obligation, by requesting it from the address below.

THE BARRETT DIVISION
ALLIED CHEMICAL & DYE CORPORATION
40 RECTOR STREET, NEW YORK 6, N. Y.

Barrett

processing of yarns and fibers and improves the appearance and durability of fabrics. In insecticides, agricultural sprays and the fat liquoring of leather the substantive quality of these materials gives the same desirable results.

Nopcogen products have also proved useful as wetting, dispersing and softening agents, as antistatic and ore flotation chemicals as well as synthetic waxes.

Soybean Nutrient for Streptomycin NP 559

Increased production of streptomycin is resulting from development of a nutrient made from soybeans. The nutrient, made by A. E. Staley Manufacturing Co., is consumed by streptomycin-producing mold

during the course of an extremely involved manufacturing process. It combines the advantages of greater yield and lower material costs.

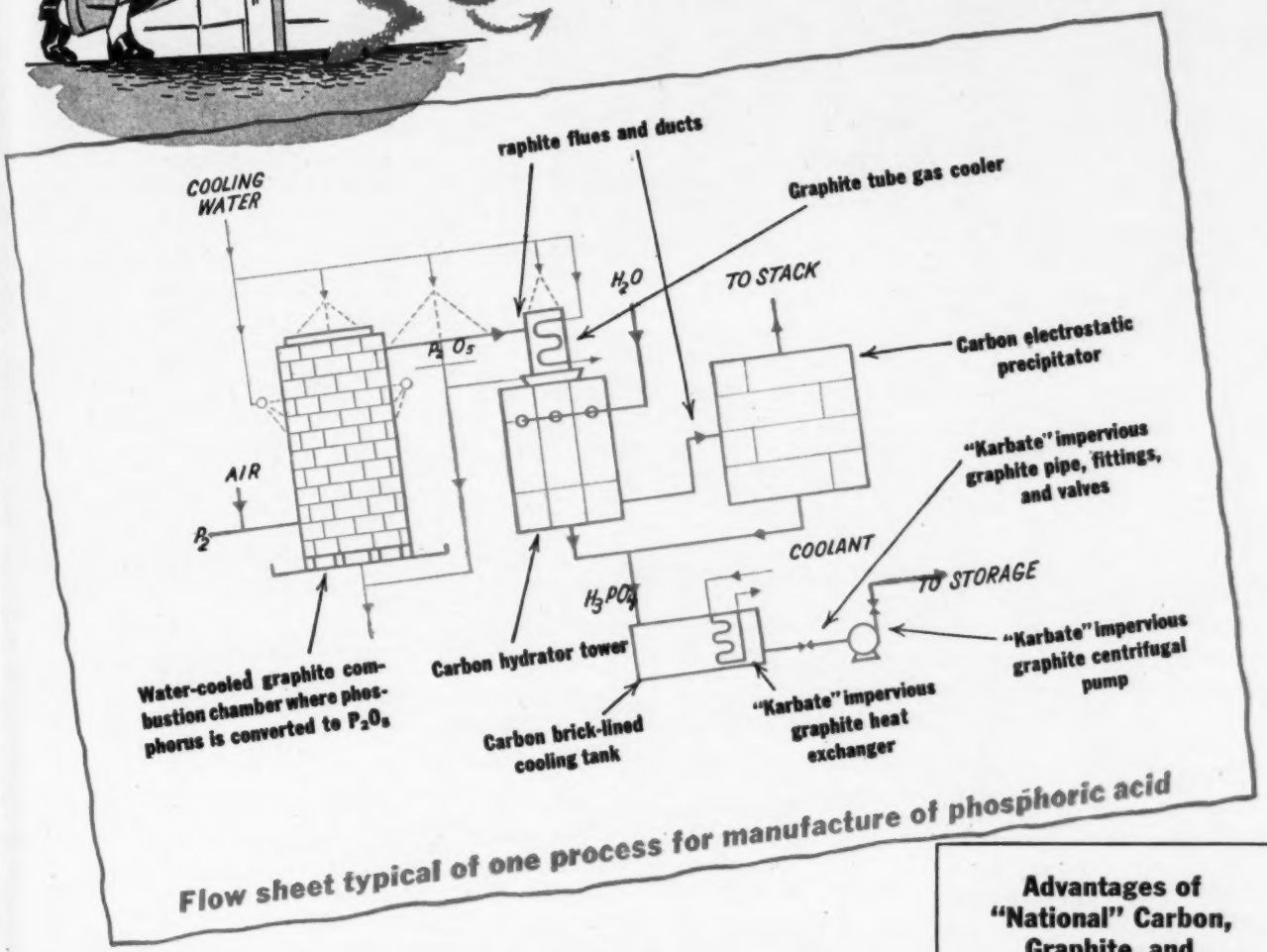
The new soybean meal nutrient takes the place of complex growth-producing substances such as those containing meat extract which have been used in the past. Of equal importance to possibilities of greatly increased production is the fact that the new nutrient's cost to producers is roughly one-tenth that of the protein complex materials. There is no danger that there are not enough soybeans to produce the nutrient needed by the recently stepped-up capacity of the industry. The nutrient alters neither the fundamental qualities of the end product, streptomycin, nor the tremendously complex chemical processing needed to produce the drug.

Water-Soluble Polymer NP 560

A new water-soluble polymer with unusual qualities of uniformity and stability, adhesion, compatibility and ability to be insolubilized, has been announced by the Resinous Products & Chemical Company.

Preliminary tests of the polymer, called Amberlite W-1, reveal its value in the manufacture of wet-strength paper, adhe-

...in manufacturing phosphoric acid...with Carbon, Graphite, and "Karbate" Impervious Graphite



Flow sheet typical of one process for manufacture of phosphoric acid

CARBON, Graphite, and "Karbate" materials are ideal for the construction of complete systems for the manufacture of phosphoric acid and related compounds. They are unattacked by phosphorus, its oxides and acids, or by those contaminants normally encountered in the manufacture of these products.

Graphite material, because of its high thermal conductivity, is required for combustion chambers and gas coolers; but either carbon or graphite is suitable for hydrators and precipitators. Chamber and hydrator construction may be either vertical or horizontal, completely of graphite and carbon, or graphite and carbon-lined steel, depending upon individual design considerations.

Advantages of "National" Carbon, Graphite, and "Karbate" materials

- No melting point
- Immune to thermal shock
- No metallic contamination of product
- Light weight with adequate strength
- Easy to machine and install

NATIONAL CARBON COMPANY, INC.

Unit of Union Carbide and Carbon Corporation

UCC

30 East 42nd Street, New York 17, N. Y.

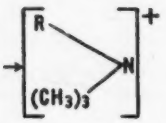
Division Sales Offices: Atlanta, Chicago, Dallas, Kansas City, New York, Pittsburgh, San Francisco

The terms "Karbate" and "National" are registered trade-marks of National Carbon Company, Inc.

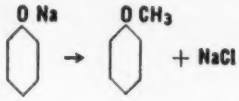
UTILIZATION OF ANSUL CH_3Cl

These examples illustrate a few specific applications for Ansul Methyl Chloride in research laboratory and industrial practices:

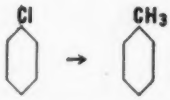
GRIGNARD . . . . . $CH_3Cl + Mg \rightarrow CH_3MgCl$

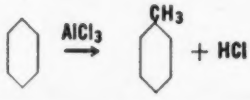
QUATERNARIES . . . . $CH_3Cl + RNH_2 \rightarrow$  Cl^-

ALIPHATIC ETHERS . $CH_3Cl + NaOR \rightarrow CH_3-O-R + NaCl$

AROMATIC ETHERS . $CH_3Cl +$  $+ NaCl$

ALIPHATIC HYDROCARBONS . . . $CH_3Cl + RNa \rightarrow CH_3-R + NaCl$

AROMATIC HYDROCARBONS . . . $CH_3Cl + Na +$  $+ NaCl$

" " . . . $CH_3Cl +$  $+ HCl$

SILICONES . . . . . $SiCl_4 + 2CH_3MgCl \rightarrow (CH_3)_2SiCl_2 + 2MgCl_2$

In addition Ansul Liquid Methyl Chloride is being currently used as a low temperature solvent • propellent solvent • extractant • refrigerant • **and in other laboratory and industrial processes.**

Methyl Chloride is a low priced chemical available in tank cars and large and small cylinders.

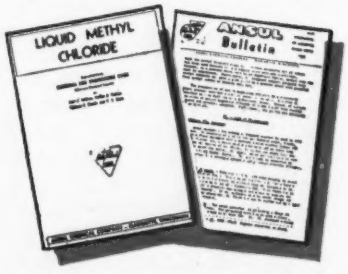
LIQUID Methyl Chloride ANSUL*

PHYSICAL PROPERTIES

Chemical formula	CH_3Cl
Molecular weight	50.491
Color (gas or liquid)	Colorless
Odor	Ethereal, non-irritating
Melting point	−144° F. (−97.6° C.)
Boiling point	−10.65° F. (−23.7° C.)
Critical Temperature	289.6° F. (143.1° C.)
Critical pressure	969.2 lbs. per sq. in. abs.
Solubility	Methyl chloride in water—3 to 4 volumes methyl chloride vapor in 1 volume of water at ordinary temperatures and atmospheric pressure—methyl chloride in alcohol—readily soluble.
Specific gravity of liquid	.909

*REG. U. S. PAT. OFF.

Consult Ansul's research and technical departments on these and other applications of Methyl Chloride.



Write for treatise on Ansul Liquid Methyl Chloride and request bulletin describing the specific laboratory and industrial application in which you are interested.

For your SULFUR DIOXIDE *applications . . . . Use* ANSUL SULFUR DIOXIDE

ANSUL CHEMICAL COMPANY
INDUSTRIAL CHEMICALS DIVISION, MARINETTE, WIS.
60 E. 42nd St., New York — 535 Chestnut St., Philadelphia

sives and cements, as a thickener for latex and Neoprene, and indicate potentialities for reproduction operations, printing techniques, sizing and all types of coatings.

The material is compatible with numerous water-soluble film-formers, such as casein, polyvinyl alcohol, carboxy methyl cellulose, and lecithin; dries to a non-tacky film although it exhibits tackiness similar to a rubber cement during drying; does not support bacterial or fungal growth; and may be insolubilized by heat, formaldehyde or metallic salts. Air-dried films of the versatile polymer are clear, essentially colorless, quite brittle, and show excellent adhesion to paper, fabric and porous surfaces. In dilute solution, Amberlite W-1 will emulsify monomeric lasticizers and Paraplex resins to produce stable emulsions.

Beta-Propiolactone NP 561

A new organic chemical material known as beta-propiolactone promises to become as important to the chemical industry as acetylene or chlorine.

A product of The B. F. Goodrich Co. makes possible the commercial production of whole series of organic chemicals hitherto regarded as laboratory curiosities. Beta-propiolactone promises to open up new and cheaper reaction methods of producing many basic materials already used in the chemical and plastics industries.

Substances which may be made from the new material range from the liquid used in setting permanent waves to materials used in leather processing. Other fields in which it is expected to contribute either better or more economical products include: compounds for preserving fats and oils; thermo-setting resin products; plant-growth initiators and mold-growth inhibitors; essential ingredients for certain man-made rubbers; fungicides; selective weed killers; polymerizable esters for plastic products; intermediates for the paint industry; and rubber compounding chemicals and solvents.

Fundamentally, the method of manufacture of the substance is through the combination of ketene and formaldehyde. The basic raw materials are coal and water, and ethyl alcohol, the latter derivable from grain, petroleum or coal.

Continuous $Ag NO_3$ Process NP 562

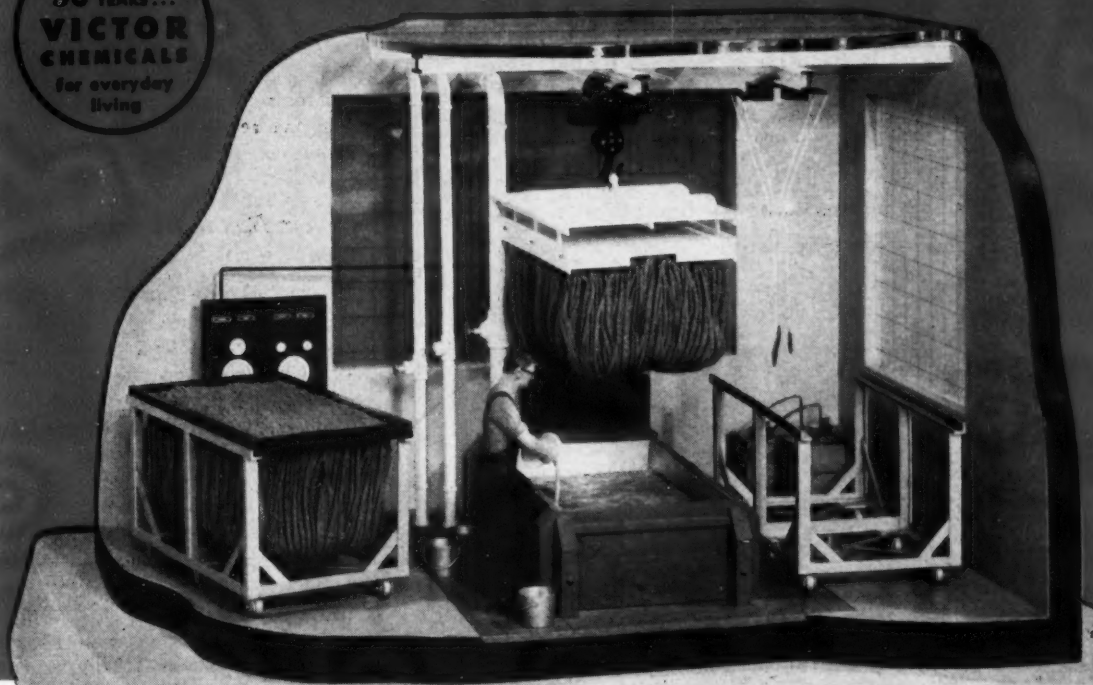
A new way of making silver nitrate crystals has been perfected by Eastman Kodak Co.

Designed by Kodak before the war, the recently completed system uses machinery that makes the silver nitrate crystals continuously and dries them in a few minutes.

Here is how the new silver nitrate process works: First, 75-pound silver ingots are dissolved in nitric acid. The

VICTOR Chemicals

FOR 50 YEARS... VICTOR CHEMICALS for everyday living



for... TEXTILES

VICTOR CHEMICAL WORKS

In dyeing textiles, Victor Formic Acid is extensively used as an acidulent in the dye bath. As a medium-strength acid, it produces colors that are both level and fast. Complete exhaustion of the dye bath assures economy, and because of the volatility of formic acid the danger of tendering the fabric is eliminated. ¶ Other Victor chemicals used in the textile industry include: **Oxalic Acid** (bleaching), **Sodium Phosphates** (buffer in dye baths, detergents, dyeing, process water treatment, water softeners), **Victawet 58 B** (dispersing agent), **Victawet 35 B, Victawet 12** (dye carriers, penetrants), **Phosphoric Acid** (dyeing), **Flexible Fyrex, Ammonium Phosphates** (flameproofing), **Victamine D** (textile softening agent), **Aluminum Formate** (waterproofing).

VICTOR CHEMICAL WORKS, 141 W. Jackson Blvd., Chicago 4, Ill.
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Plants: NASHVILLE · MT. PLEASANT, TENN. · CHICAGO HEIGHTS, ILL. · VICTOR, FLA.

WE'VE DONE IT FOR DOCTORS . . .

. . . and for nurses and medical attendants and others who minister to the sick. And we've done it for the patients themselves in helping to lessen their discomfort. For in the course of certain ills there sometimes develop highly offensive odors. To alleviate such odors is to improve the sickroom conditions for the patients as well as the working conditions for those attending to their ills. Our laboratories have developed aromatic deodorants that accomplish this most effectively and economically. As harmless as any perfume, these aromatics mask unpleasant odors by giving the sickroom atmosphere a freshly cleaned effect. But sickroom odor control is just one of the hundreds of deodorizing problems we have solved. What now concerns us are the problems we *haven't* solved. Maybe *yours* is one of them and . . .

PERHAPS WE CAN DO IT FOR YOU!

Let's assume you manufacture a product which retains a rather unpleasant residual odor in its finished state and that this odor tends to retard its sales. Or let's put it another way: Suppose this product possessed a faintly *pleasant* and *appropriate* odor. Wouldn't this subtle quality tend to help rather than hinder its sale? Countless products sell better today because undesirable residual odors have been eliminated or because substitute fragrances have given them added appeal. Plastic articles, synthetic rubber, leather, linoleums, paints, printing inks and a wide range of other commercial products have been improved from a selling point of view by the work of our Technical Laboratories. They will be glad to work on similar problems for *you*.

FRITZSCHE *Established* 1871 **Brothers, Inc.**

PORT AUTHORITY BUILDING, 76 NINTH AVENUE, NEW YORK 11, N. Y.

BRANCH OFFICES *and* *STOCKS: *Atlanta, Ga., *Boston, Mass., *Chicago, Ill., Cincinnati, Ohio, Cleveland, Ohio; Dallas, Texas, Detroit, Mich., *Los Angeles, Calif., Philadelphia, Pa., San Francisco, Calif., *St. Louis, Mo., *Toronto, Canada and *Mexico, D. F. FACTORIES: Clifton, N. J. and Seillans (Var), France.

resulting greenish liquid goes into storage tanks. From these tanks the solution is pumped slowly into crystallizers. The crystallizers are 1,000-gallon stainless steel tanks. In them the liquid is constantly stirred by circulating pumps. This stirring and the constant addition of fresh silver nitrate solution result in the formation and growth of silver nitrate crystals in the lower part of the tank. The crystals then are drawn from the tank through a pipe and poured into perforated, stainless steel baskets. The baskets are centrifuged so most of the moisture in the crystals is carried off by the spinning action. Each basket contains 60-70 pounds of crystals.

Next the crystals are redissolved in distilled water. Again they go through the same crystallizing steps. After the wet crystals come from the crystallizer the second time and have been centrifuged until they are only damp, they are dumped into a rotary drying drum. At the other end of the revolving drum the crystals pour out completely dry.

Quicker Metal Buffing Compounds NP 563

The new Hydro-Buff "500" series of buffing compounds made by the Hydro Chemical Company offers possibilities for decreasing buffing operational time on both ferrous and non-ferrous metals. It is claimed that by using these compounds, cleaning time of pieces is cut to 30-45 seconds.

The "500" series of compounds constitute no fire hazard since they are non-inflammable and are soluble in all proportions in the chlorinated hydrocarbons. Hydro-Buff is well suited for plants equipped for vapor-phase degreasing operations and is also readily removed in the water-phase cleaning cycle. The retention of Hydro-Buff on buffing wheels is good; it cuts and colors in the same operation, eliminating the need for rouge; and the film remaining on the piece, before cleaning, will protect against oxidation and staining for long periods of time.

New Plating Processes NP 564

Two plating processes have been developed by the Hanson-Van Winkle-Munning Co. The Cadux HS Process for bright cadmium plating promises the following advantages: increase of brightness of deposit; higher tolerance for impurities; higher permissible current densities; and improved covering power and appearance on rough and imperfect surfaces. The range of the bath is from 20 to 40 amp./sq. ft. with an optimum current density of 30 to 35 amp./sq. ft. in still plating. With agitation, current densities up to 70 amp./sq. ft. have been employed.

A process for electroplating which

BENZALDEHYDE

N. F. and Technical Grades

***Flavoring Agent*—in candies, cake mixes, beverages.**
***Perfume*—in soaps, cosmetics, and in violet or heliotrope-type perfumes.**
***Pharmaceutical Manufacture*—in synthesis of analgesics, antipyretics, antispasmodics, and other organic products.**

Available in boxed tins, glass carboys, and stainless steel drums.

Also, specify Heyden for quality benzaldehyde derivatives: Ortho chlor benzaldehyde . . . Para chlor benzaldehyde . 2,4-dichlor benzaldehyde . . . 3,4-dichlor benzaldehyde.

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CHEMICAL CORPORATION
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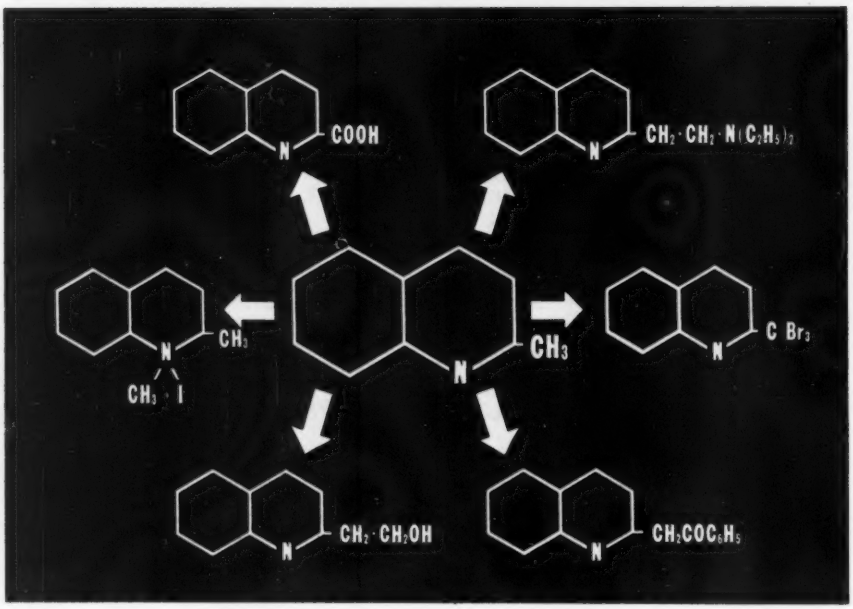
Reilly QUINALDINE



A Compound of Many Potential Uses

• Above are shown a few of the intermediates that can be readily formed from Reilly Quinaldine.

The presence of the reactive methyl group makes Quinaldine a compound of many potential uses. Photographic chemicals, pharmaceuticals, dyestuffs, rubber accelerators and corrosion inhibitors are a few of the many fields of application.

Introduced during the war for essential applications, Reilly Quinaldine is now available to the trade in substantial quantities.

Your inquiries on Quinaldine or any other Reilly coal tar chemical will have prompt attention.

Reilly COAL TAR PRODUCTS

REILLY TAR & CHEMICAL CORPORATION

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500 Fifth Ave., New York 18, N. Y. • 2513 S. Damen Ave., Chicago 8, Illinois

Reilly Coal Tar Chemicals For Industry

markedly reduces polishing costs as well as providing an electrodeposit of great smoothness, increased density and decreased porosity involves a novel, periodic reverse plating cycle in which the plating current is reversed briefly at short periodic intervals. Better plate distribution and thicker than normal deposits are obtained at higher current densities than are generally used.

Laboratory study has shown that excellent results may be obtained with high-speed copper cyanide baths using a five-second plating to one-second deplating cycle. However, in commercial practice it has been shown that a 20-4 second cycle, as well as cycles intermediate between this and the 5-1 second cycle, are quite satisfactory.

The PR Process has also been found to have advantages when applied to the H-VW-M Amine Copper Process to the extent that higher current densities may be used and improved deposits may be obtained. Early experimental work indicates that the process is also applicable to acid baths such as the conventionad nickel baths.

Equipment available at the present time consists of an electronic time-contactor unit capable of handling up to fifty amperes with a range of a fraction of a second to twenty-five seconds for each portion (anodic and cathodic) of the time cycle.

New Paint Pigment Saves Lead NP 565

A new pigment which will make three times as much paint from the same amount of lead as is now used has been found by the National Lead Co. Soon to go into commercial production, it will conserve the already inadequate lead supply and relieve the current shortage of superior house paints. Exhaustive paint tests have shown that this pigment is the equal from a performance standpoint of the lead pigments now employed. One hundred pounds of lead will make six and three-quarter solid gallons of this pigment compared to two and one-seventh solid gallons of white lead.

The function of lead pigments in a paint film is to react with the decomposition products of the vehicle, many of which are acidic in nature, converting them to lead compounds which fortify rather than destroy the film. In the course of this film-saving reaction only the surface of the solid pigment particle is consumed, the rest of the particle remaining to perform its normal function of hiding the surface to which the paint was applied. Only the surface of the lead pigment particle is effective in imparting long life to a paint film.

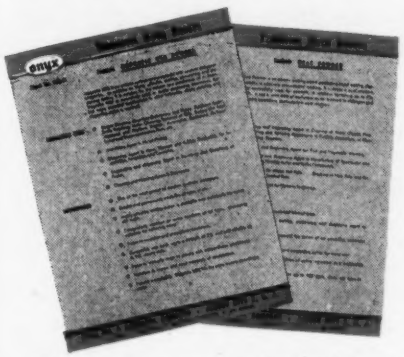
The new pigment is produced by grinding silica sand in the presence of water to an extremly fine particle size. Lead oxide is then added with a small amount of sul-

ONYX IONICS

November — Newsworthy Items for Technologists and Production Men — 1947

Onyx Technical Data Sheets

Facts without trimmings! That is the function of Onyx Technical Data Sheets. Each covers an individual Onyx material, giving its chemical and physical characteristics, performance data, major advantages and detailed data on industrial applications.



More are in preparation, but at this writing Onyx Technical Data Sheets are available on

Maprofix NEU — Anionic wetting and dispersing agent with high foaming qualities.

Neutronyx Series — Non-ionic surface-active agents possessing attractive detergent, emulsifying and detergent properties.

NSAE Powder — Anionic wetting agent possessing rapid wetting properties in relatively concentrated solution. Stable to acids.

Write for as many copies of each sheet as you can use.

If You Make Metal Cleaning Compounds

Investigate these Onyx materials. NSAE Powder, providing both wetting and dispersing action, is stable in acid solutions. It is used in compounding cleaners for use prior to plating, and in pickling and electro-plating solutions.

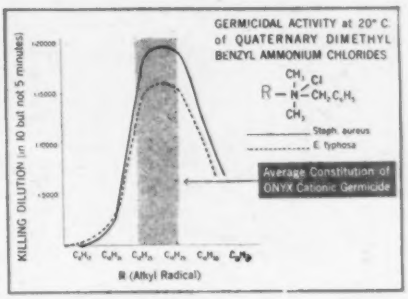
Maprofix NEU Powder, because of its exceptional wetting, penetrating and dispersing action, plus the volume and persistence of its foam, is in extensive use not only in metal cleaning compounds, but in cleaners for aviation parts, automobile equipment, railroad and other diesel engines, etc.

The Neutronyx series of non-ionic surface-active agents deserves investigation because of their effectiveness in hard water conditions and in combination with organic solvents for cleaning action involving oils, greases and other stubborn dirts.

New High Standards in Sanitization with Onyx BTC . . .

Onyx BTC is an alkyl dimethyl benzyl ammonium chloride, cationic in character. It is one of the most effective bactericides and fungicides now available, with the outstanding advantage of non-toxicity in practically all use-dilutions.

Onyx BTC is sold as a concentrate, containing 50% active material. This concentrate is further diluted with water by the germicide manufacturer or other users. A 10% solution becomes an all-purpose germicide and fungicide, as well as bacteriostatic agent for use by the ultimate consumer at various suitable use-dilutions, depending on the sanitizing or disinfecting job to be done.



cidal action of Onyx BTC is the rigid control exercised in manufacture to maintain the average constitution of the alkyl radical within the range of $C_{12}H_{25}$ to $C_{14}H_{29}$ — the composition which has been found to produce maximum bactericidal and fungicidal action.

This cationic germicide effects rapid, non-selective bacteriostatic and bactericidal action at high dilutions, with an accompanying powerful deodorizing effect. Toxicity at any use-dilution is low, while most use-dilutions give non-toxic solutions. No primary irritation or sensitization is caused by any of its solutions.

Used for sanitizing glasses, cutlery, silverware, equipment, storage bins, etc., Onyx BTC has many out-of-the-ordinary uses, such as the cold sanitization of surgical instruments, control of poultry diseases by addition to feed and water, control of algae in swimming pools, cooling equipment, etc.

Normal use-dilutions give colorless, practically odorless solutions relatively non-corrosive on most metals and construction materials. All dilutions are completely stable. Solutions are compatible with most solvents except those of anionic character.

Inquiries are invited, not only from manufacturers of germicides and fungicides, but from makers of industrial cleaning compounds, veterinary medicines and any others who see possibilities for profitable use of this safe and effective germicide.

Non-Toxic Slime Control For Paper Mills

The difficult problem of adequate control of slime in paper mills has been complicated by the fact that heretofore effective control materials have been highly toxic. The Onyx research department has been working for the past two years on the development of suitable non-toxic slime control materials. As a result of this work, a group of quaternary ammonium halides, the Ammonyxides, has been developed which offers considerable promise for safe, effective slime control.

A six-week test in a large Canadian newsprint mill in which Ammonyxides were used in direct comparison with organic mercurials and chlorinated phenols, indicates that the non-toxic Ammonyxides are as effective as these other materials in controlling slime.

Copies of Onyx Technical Report P-1 describing this test in complete detail will be supplied on request.

NEW DEVELOPMENTS

For Further Details Write Onyx

Wetting Agent for Pickling, Stable in Acid Solutions. Onyx NSAE Powder is an anionic wetting agent possessing rapid wetting characteristics in relatively concentrated solution. It is stable in acid solutions, being successfully used in solutions containing up to 4% H_2SO_4. No. 5

•

Heavy, Persistent Foaming for Shampoos. Maprofix NEU Powder is an anionic surface-active material with unusually effective wetting, penetrating and dispersing action. The volume and persistence of its foam make it applicable not only to shampoos, but to metal, carpet and many other industrial cleaning compounds. No. 6

•

Improved Washing of Vegetables and Fruits is obtained from cleaning compounds containing NSAE Powder, due to the better wetting and dispersing effects it provides. No. 7

•

Non-Ionic Emulsification and Dispersing Action in Cosmetic Manufacture. The Neutronyx series of non-ionic surface-active agents possesses unusually attractive emulsifying, detergent, foaming and dispersing characteristics, made all the more interesting because of their compatibility with electrolytes, water hardness and both anionic and cationic surface-active agents. No. 8

onyx

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The many uses of "Virginia" Zinc Sulfate include chemical and pharmaceutical manufacturing, electroplating, glue and adhesives, paint trades, rayon and plastics manufacturing, metallurgical and agricultural applications. It is an exceptionally pure, 89 per cent granular, free-flowing crystal, and is quickly and completely soluble in water . . . zinc content, 36 per cent. Shipped in 100 lb. bags and 400 lb. barrels.

It may well be that "Virginia" Zinc Sulfate can play an important part in perfecting your processes. Our Research Department will be glad to survey your needs for possible applications. Call upon us freely. VIRGINIA SMELTING COMPANY, West Norfolk, Virginia. *Established 1898.*

VIRGINIA *Chemicals*

SULFUR DIOXIDE
SODIUM HYDROSULPHITE • ZINC HYDROSULPHITE
ZINC SULFATE

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furic acid to convert part of the lead oxide to lead sulfate. This results in an intimate mixture of the ingredients in the water. This mixture is dried and heated in a furnace to a dull red heat for several hours under controlled conditions. The resulting product is such that the individual particles are each coated with a thin layer of lead silicate and lead sulfate.

This skin or surface layer is firmly adherent to the underlying silica core and is, in fact, an integral part of the grain. The lead silicate and lead sulfate are available for reaction with the decomposition products in paint films, thus serving as if the entire particle were lead silicate and lead sulfate.

Acid-Resistant Glass NP 566

A radically new type of glass which contains no sand, resists the corrosive attack of hydrofluoric acid and uranium hexafluoride. Major ingredients of this glass is phosphorus pentoxide.

Developed by the American Optical Company, the new glass, the first ever known to resist the attack of hydrofluoric acid, is expected to simplify the handling of this important acid which is used in scientific experiments and many important industrial operations, particularly oil refining and synthetic rubber manufacture.

Previously the use of hydrofluoric acid presented difficulties because it could be shipped only in lead or wax containers, while in the laboratory it had to be processed in platinum or gold retorts which prevented visual observation of chemical reactions.

To determine the acid resisting property of the new glass during its development, a piece of it was immersed in a bath of hydrofluoric acid for 50 hours. At the end of that time the glass was substantially transparent, and to the naked eye showed no obvious attack.

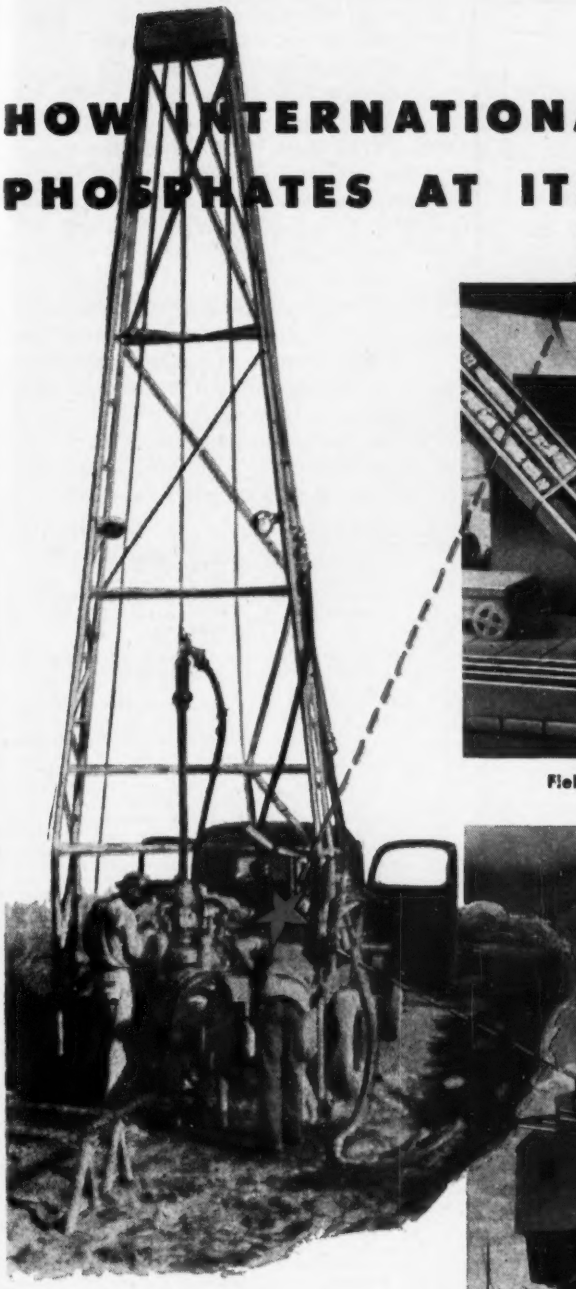
At the same time a piece of ordinary glass made of sand, lime and soda was immersed in the acid and in few hours was converted into a chalky mass. Even the tough and seemingly indestructible glass used in the manufacture of laboratory and kitchen-ware was rapidly attacked.

Plans for the manufacture of the new glass are now being made. Its potential uses are in the fabrication of test tubes, beakers, bottles, evaporating dishes and other containers; window panes for laboratories and factories where acids are employed; lenses for safety goggles and helmets; and glass gauges to observe and check the action of acids in metal cylinders and reaction vessels.

Continuous Vinyl Ether Preparation

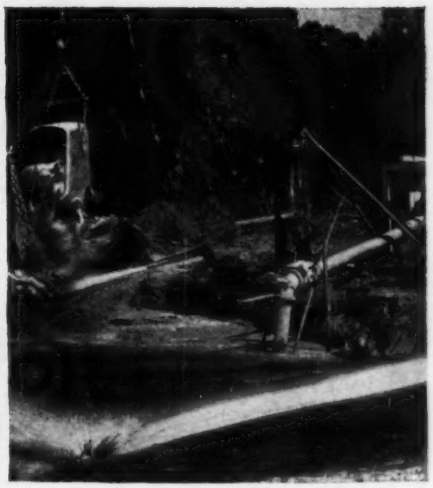
A new continuous method for the preparation of vinyl ethers has been reported in *British Plastics,* September, 1947. The

HOW INTERNATIONAL MINES LIFE GIVING PHOSPHATES AT ITS FLORIDA OPERATIONS

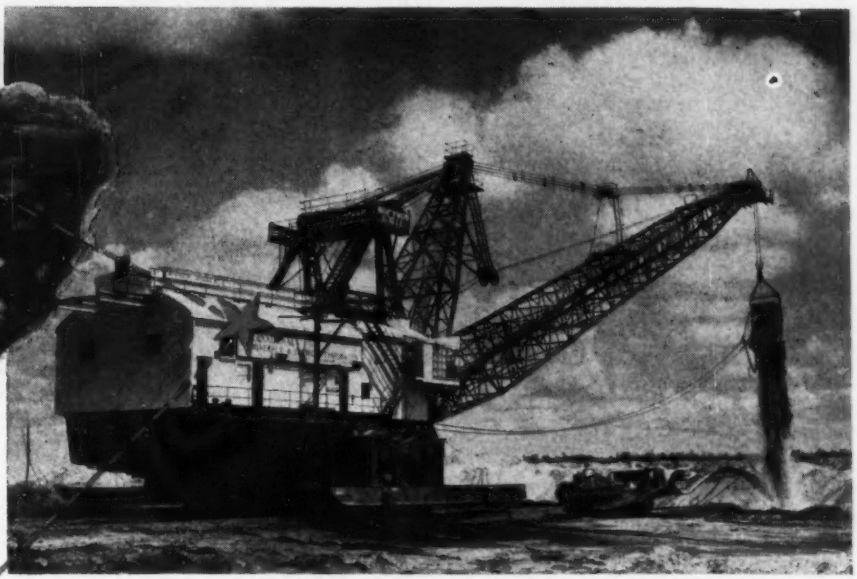


Men prospecting for phosphate

Field research establishes value of territory



Hydraulic water "guns" flush matrix into pipeline

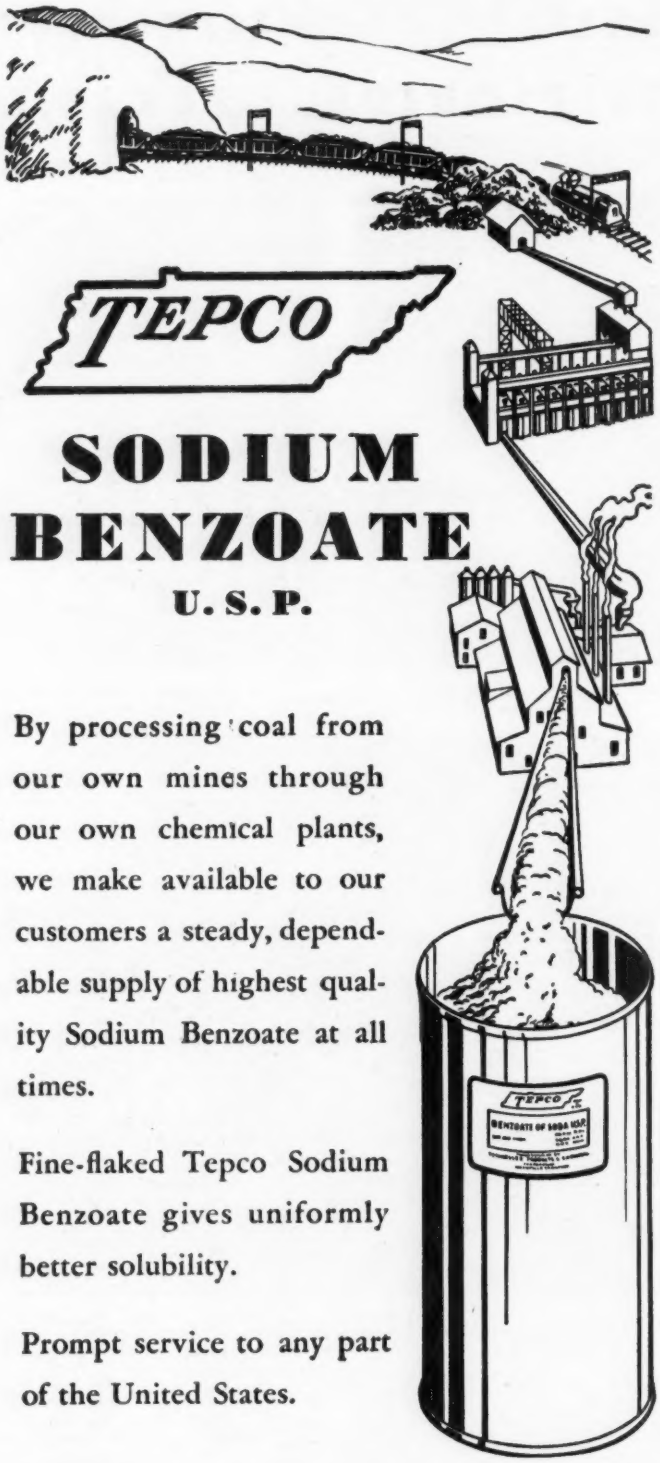


Dragline used for removing overburden and mining matrix

For more than 38 years, International Phosphates . . . from the Florida and Tennessee fields . . . have played a major role in the health and welfare of our nation. The principal use of phosphate—one of America's most precious mineral resources—is in agriculture where its rich, chemical treasures contribute in an essential way to soil fertility. Without phosphorous, life as we know it would be impossible as the structure, growth and well-being of all things—plant, animal and man—depend on it for existence.

This is the first in a series of 3 pictorial descriptions showing primary operations in the Mining, Recovery and Preparation of International Phosphate Rock for use in industry and agriculture.

PHOSPHATE DIVISION
International
MINERALS & CHEMICAL CORPORATION
General Offices: 20 North Wacker Drive, Chicago 6



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feature of the process consists in dissolving the acetylene in alcohol or in the phenol with which the acetylene should react, at low temperature and under the pressure of a few atmospheres.

This solution is then injected in the reactor, at the pressure necessary to keep the acetylene dissolved at the reaction temperature. The process is a continuous one, the conversion is high, so that high outputs can be obtained with relatively small installations.

While the acetylene is compressed only to a few atmospheres, in order to facilitate its dissolution in the hydroxy compound at a low temperature, the reaction takes place actually at a high pressure.

No danger of explosion is present, notwithstanding the high pressure and the absence of an inert gas as a diluent.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912, AS AMENDED BY THE ACTS OF MARCH 3, 1933, AND JULY 2, 1946

Of *Chemical Industries*, published monthly except twice in November, at Philadelphia 4, Pa., for October 14, 1947.

State of New York, County of New York, ss.

Before me, a Notary Public in and for the State and county aforesaid, personally appeared Robert L. Taylor, who, having been duly sworn according to law, deposes and says that he is the Editor and Manager of *Chemical Industries* and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the act of August 24, 1912, as amended by the acts of March 3, 1933, and July 2, 1946 (section 537, Postal Laws and Regulations), printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, Maclean-Hunter Publishing Corporation, 522 Fifth Avenue, New York 18, N. Y.; Editor, Robert L. Taylor, 522 Fifth Avenue, New York 18, N. Y.; Managing Editor, W. Alec Jordan, 522 Fifth Avenue, New York 18, N. Y.; Business Manager, L. Charles Todaro, 522 Fifth Avenue, New York 18, N. Y.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one percent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.) Maclean-Hunter Publishing Corporation, 522 Fifth Avenue, N. Y. The stockholders of the Maclean-Hunter Publishing Corporation are: John R. Thompson, 2511 Coyle Avenue, Chicago; J. L. Frazier, 2043 Orrington Ave., Evanston, Illinois; Col. J. M. Maclean, 7 Austin Terrace, Toronto, Ontario; Horace T. Hunter, 120 Inglewood Drive, Toronto; Maclean-Hunter Pub. Co., Ltd., 481 University Avenue, Toronto.

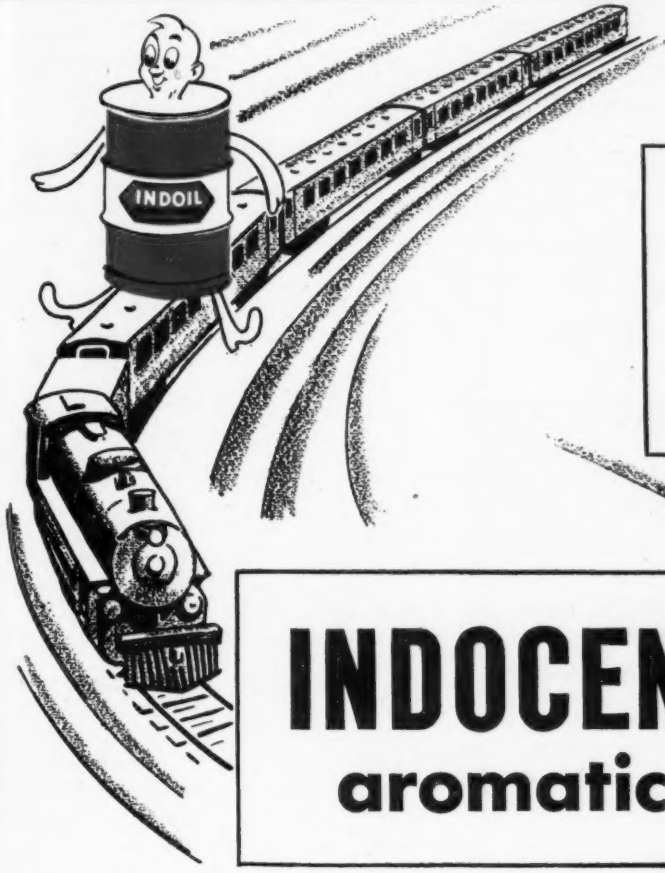
3. That the known bondholders, mortgagees, and other security holders, owning or holding 1 percent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

ROBERT L. TAYLOR,
Editor and Manager.

Sworn to and subscribed before me this 14th day of October, 1947. Sigmund Milau, Notary Public, N. Y. Co. Clk. #535, Reg. #485-M-9. Commission expires March 30, 1949.

INDONEX
REG. U. S. PAT. OFF.
plasticizers



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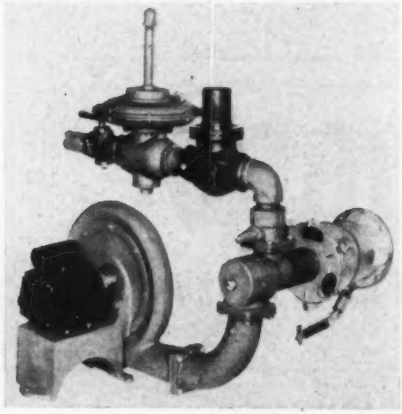
910 South Michigan Avenue Chicago 80, Illinois

NEW EQUIPMENT

Pre-Engineered Gas Combustion Assemblies QB 356

Heart of the new Pow-R-Semblies, complete pre-engineered gas combustion assemblies of the Industrial Division of the Bryant Heater Co., is the newly developed "Mixjector". Using air from a constant-pressure blower, the Mixjector



draws gas through a zero governor in the quantity required for the selected mixture, which is supplied to the burner nozzle. The velocity of the flame draws in secondary air which keeps the nozzle cool. A shutter on the back of the burner cage controls secondary air where a heavy draft is available.

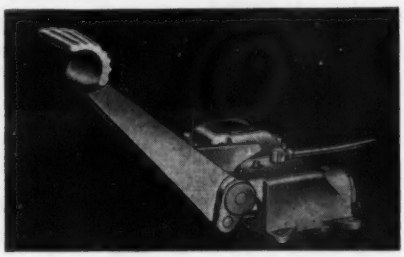
Pow-R-Semblies are available in eight capacities, ranging from 400,000 btu./hr. rated at 8 boiler hp., with a 1½" gas inlet and ⅛ hp. blower; to a unit with a rating of 3,300,000 btu./hr. and 66 boiler hp., a 3" gas inlet and 3 hp. blower.

The units burn any low pressure gas, from 400 btu. upwards, at 3" to 11" water column. A single, easily locked adjustment sets the air/gas ratio, maintaining the flame characteristics desired until the adjustment is changed. The sensitive adjustment permits the choice of a hard, sharp flame, a long, soft, billowy flame, or any in between.

Each size is available in four variations of control: Type A for manual burner lighting and manual air valve setting; Type B using an atmosphere pilot, with remote "off-on" control from a suitable pressure or temperature instrument; Type C provides manual lighting with "high-low" automatic instrument control; An atmospheric pilot, with "high-low" or "high-low-off" automatic control from one or two instruments being provided in Type D.

Hydraulic Foot Pump QB 357

A new model lightweight hydraulic foot pump has recently been introduced by the Lyon-Raymond Corp. The pump is so designed so that the pedal return spring is built inside the pump body and



the release controlled by slightly raising the single pump pedal. The total weight of the pump is only 13¼ lbs.

Working pressures up to 1500 psi can be obtained with this model. The usable oil capacity is 15 cubic inches, the oil being contained in a sealed reservoir requiring no vent; allowing the pump to be mounted in offset positions if desired.

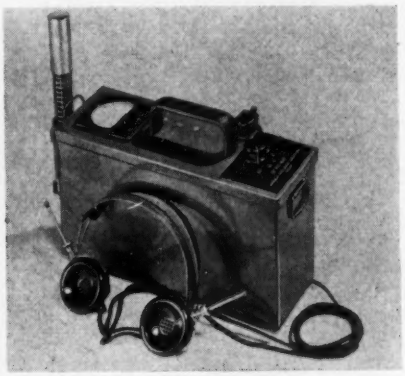
Cylindrical Cooling Tower QB 358

The cylindrical cooling tower is a new addition to the line of cooling tower equipment of the Santa Fe Tank and Tower Co. The cylindrical tower is designed to eliminate dead air spaces which occur in present day rectangular and octagon shaped towers. The circular design allows air to enter the tower from any point of the entire 360° circumference, instead of from only two sides—or two sides and four corners, giving a more even distribution of air, and reducing the need for baffles or diverters.

It may be built in either individual or multiple-cell units . . . of wood or steel construction and can be furnished in single wall construction (2" nominal) or in double wall construction with the inner wall of 2" nominal thickness; and the outer wall of 1" nominal thickness or less.

Portable Radioactivity Meter QB 359

A new portable beta-gamma count rate meter has just been introduced by Instrument Development Laboratories. It is



intended for qualitative and semi-quantitative measurement of X, gamma, and beta radiation.

The small size (11"x4"x6") and weight (9½ lbs) make it convenient for finding radon needles and in geological surveying for radioactive ores.

The Model 2610 meter has three ranges —0.2, 2, and 20 milli-roentgens per hour full scale—which give the instrument a range below the cosmic ray background and above the health tolerance level.

High Pressure Liquid Pump QB 360

The "Twin-Line" high pressure liquid pump, offering great flexibility in handling a variety of liquids at volumes up to 64,000 bbl. per day and pressures up to 200 lb. per square inch, has been developed by The Cooper-Bessemer Corp.

Among the many applications are, oil pipe lines; pressure maintenance by water injection in oil production, and for water flooding; lean oil pumping in absorption plants; hot and cold oil charging service in oil refining; de-scaling service in steel mills; de-barking logs in the wood pulp industry; and high-pressure boiler feeding.

The "Twin-Line" design offers a comparatively large volume output and a great reduction in overall weight and space through the application of high rotative speeds to opposed, short-stroke

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QB 357	QB 362	QB 367	QB 372	QB 377
QB 358	QB 363	QB 368	QB 373	QB 378
QB 359	QB 364	QB 369	QB 374	QB 379
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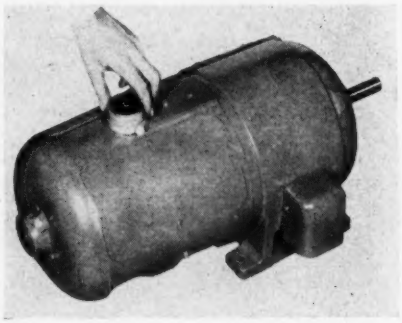
displacement plungers. The pump's normal speed of 400 rpm permits the economical use of a direct-connected prime mover in many installations, eliminating gear or belt speed reduction. Plungers are available in sizes from 3" to 6" in diameter; and the pump is built with four, six, eight, ten, or twelve cylinders.

The "package type" valve assembly, containing both suction and discharge valves, can be removed and replaced by a spare unit in 12 to 15 minutes. Valve material can be varied to meet corrosive conditions. In addition, any single complete pump cylinder can be removed and replaced without disturbing any of the other cylinders.

Accurate tests with a heavy grade of fuel oil show a volumetric efficiency of 95 percent minimum at 400 rpm with 1500 psi discharge pressure, and still higher efficiency at lower speeds and pressures. The mechanical efficiency is above 92 percent.

Stepless Speed Adjustment Electric Motors QB 361

The new line of Tri-Clad brush-shifting adjustable-speed induction motors, Type ACA, of the General Electric Co. is



available in ratings from 3 to 50 hp (220, 440, and 550 volts). The new motor features stepless speed adjustment over a 3:1 ratio by simply turning a dial. The entire unit, with the exception of the starter control, is self contained in a housing only a little larger than that for a constant-speed motor of comparable rating.

Drum Clamp For Fork Truck QB 362

For safe handling of drums which must be moved singly or in an upright position to prevent spilling, Clark Tructractor, Division of Clark Equipment Co., has perfected a clamping device, adapted to any of their fork truck models.

The clamp is self-adjusting for diameters 21½" to 24" and employs a star cam permitting the operator to release the drum without dismounting. Clamping over the chime the device grips securely throughout transportation and carries up to 700 lbs. It may also be used on trucks equipped with crane, swinging boom, or special fork extension attachments.

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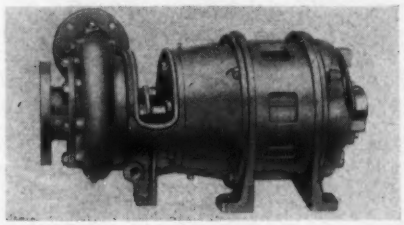
Close-coupled Centrifugal Pumps QB 363

According to the manufacturer, Goulds Pumps, Inc., their new line of "Close-Cupld" centrifugal pumps combine pump and motor on a single, compact ready-to-install assembly and operate in any



position except vertically with motor below pump. A single shaft eliminates a coupling.

A new feature is the machined stuffing box permitting the use either of a die-formed, semi-metallic packing with lantern type liquid seal ring or a mechanical seal.

A full length shaft sleeve protects the main motor and pump shaft against liquid damage. The sleeve can be removed easily for service and a provision is made for the expansion and contraction of the sleeve to prevent buckling and distortion.

A new split gland, with the halves held together with hollow washers which slip over bosses on the gland, make it unnecessary to unbolt gland halves when repacking stuffing box.

The new "Close-Cupld" pumps are available in 17 sizes with capacities up to 2000 GPM and heads up to 400 ft. depending on capacities.

Photoelectric Turbidity Recorder QB 364

The new turbidity recorder of the Ess Instrument Co. comprises a viewing chamber through which the solution to be measured is passed. Attached to one end is a light source and to the other a photo relay unit. The output from the photo relay unit is then connected to a potentiometer recorder which gives a continuous record of the turbidity. The instrument may be equipped with warning lights or electrical control points.

These instruments have been used to measure various undissolved substances or emulsions present in solutions, and has been applied to boiler feed water, water clarity, oils and solvents, and various fluids.

The instrument is available in range of 0 to 3 p.p.m., 0 to 50 p.p.m., 100 p.p.m., and up. The length of chamber used is a function of sensitivity and the range required.

Both open and closed type chambers are used. Generally, the open type chamber gives the maximum cleaning facilities but solutions flowing in a pipe line may be measured by introducing a pipe "T" with windows.

Pallet Rack and Nesting Ring QB 365

The new, all-metal, single-face pallet rack and nesting ring of Palmer-Shile Co., is especially designed for heavy industrial use, and may be built to suit specific requirements or load specifica-

tions. It is of special rolled channel steel with reinforced, all welded channel support to permit easy handling of excessively heavy loads and ideally suited for rapid handling of heavy irregular shaped pieces or parts of various sizes. Sturdily constructed steel legs provide adequate height to permit complete accessibility from all four sides.

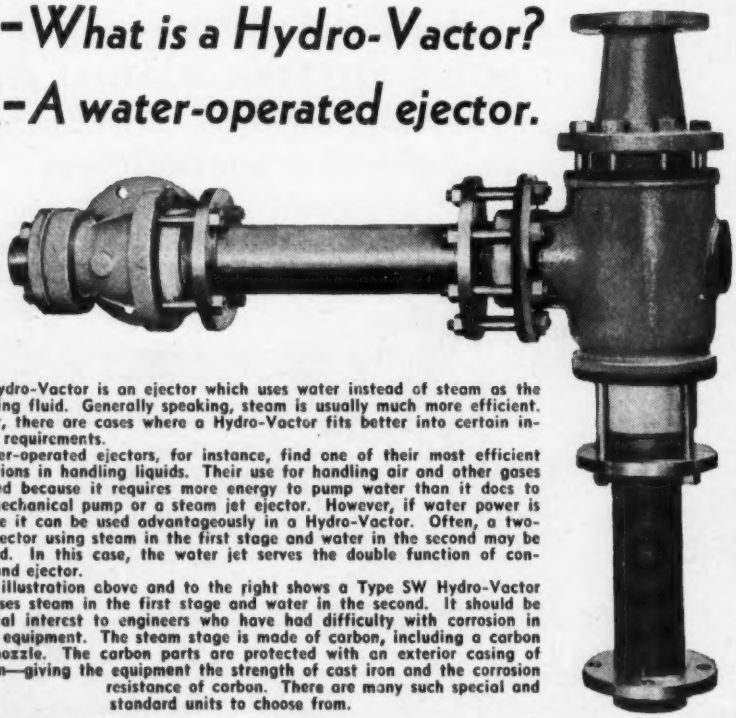
Flammable Vapor Detector QB 366

The Thermalo flammable vapor detector of Jabez Burns & Sons, Inc., consists of one or more detector cells, placed at strategic points within any enclosed area

where flammable vapors are likely to accumulate, and an instrument control case—located at any desired distance from the cell or cells. Models are available for fixed installation or portable use.

Continuous sampling of the atmosphere is effected automatically—either by direct sampling or by draw-off. (Most applications are non-aspirating.) There are no glowing filaments. Current through

Q-What is a Hydro-Vactor?
A-A water-operated ejector.



A Hydro-Vactor is an ejector which uses water instead of steam as the motivating fluid. Generally speaking, steam is usually much more efficient. However, there are cases where a Hydro-Vactor fits better into certain industrial requirements.

Water-operated ejectors, for instance, find one of their most efficient applications in handling liquids. Their use for handling air and other gases is limited because it requires more energy to pump water than it does to run a mechanical pump or a steam jet ejector. However, if water power is available it can be used advantageously in a Hydro-Vactor. Often, a two-stage ejector using steam in the first stage and water in the second may be indicated. In this case, the water jet serves the double function of condenser and ejector.

The illustration above and to the right shows a Type SW Hydro-Vactor which uses steam in the first stage and water in the second. It should be of special interest to engineers who have had difficulty with corrosion in vacuum equipment. The steam stage is made of carbon, including a carbon steam nozzle. The carbon parts are protected with an exterior casing of cast iron—giving the equipment the strength of cast iron and the corrosion resistance of carbon. There are many such special and standard units to choose from.

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Eliminate THE EXTRA STEP

Cut MIXING COSTS 30% or more

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"U. S." Drum Mixing equipment permits mixing in your own or supplier's drums . . . avoids the costly delays from emptying and cleaning fixed containers . . . eliminates danger of contamination.

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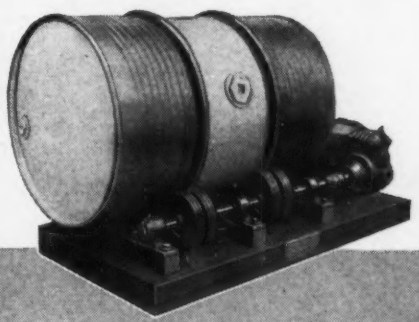
DRUM ROLLERS

"U. S." Adjustable Drum Rollers will roll any round container from a one-gallon pail to a 70-gallon drum. Eight heavy-duty rubber wheels are adjustable to provide ample clearance for rolling hoops and bung openings. Powerful, heavy-duty motor will roll loads up to 1,000 lbs. "U. S." Drum Rollers are built in sizes to handle one, two, three, or four drums, constant or variable speed drive.

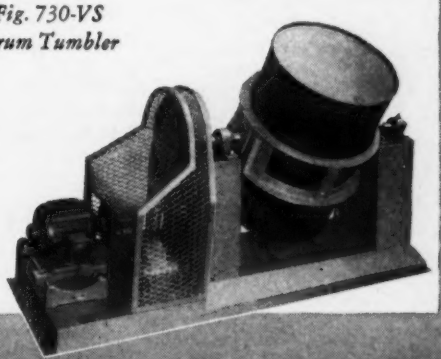
Fig. 745-S
Drum Roller



DRUM TUMBLERS

"U. S." Drum Tumblers are built in two sizes: single and double drum units to handle standard 55-gallon drums. Units to handle 30- or 70-gallon drums are available on special making order. Variable speed drive permits tumbling speeds from 8 to 21 RPM. Powerful, heavy-duty motor will handle loads up to 1,000 lbs. Adjustable yoke opens quickly and easily, locks securely.

Fig. 730-VS
Drum Tumbler



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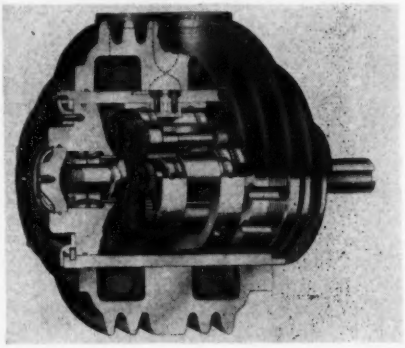
the detector varies with the vapor content of the atmosphere sampled. Whenever this fraction reaches the predetermined lower explosive limit of the vapor, the relay in the instrument case is activated, operating alarms or safety controls automatically. Failure of current or of any element in the mechanism also actuates the alarm circuit.

Standard Thermalo flammable vapor detectors operate on 100-120 volt, 60-cycle AC, but special units for other voltages and frequencies or for DC are available.

Rotary, Positive Displacement Pump QB 367

A new rotary, positive displacement pump has been developed by the Hydraulics Div. of Rockwell Mfg. Co. It is of the fixed volume, double acting type



with all operating parts held in hydraulic and dynamic balance.

The rotor assembly is suspended within the pump body on a horizontal drive shaft that freely turns in anti-friction bearing mounts. The rotor carries four, half-moon shaped impeller vanes equally spaced on its outer circumference. The vanes are geared together in a 2-to-1 ratio. As the rotor is turned by applied torque, the position of these vanes varies with respect to the sidewalls of the circular pumping chamber — always, however, so that each pair of diametrically opposed vanes forms two closed compartments per rotating cycle. There is a fixed, closely held clearance between the circumference of the impeller vanes, the sidewall of the pumping chamber and the rotor.

The liquid being pumped, in conjunction with the controlled clearances provides capillary sealing between the high and low pressure areas in the working chamber. A volumetric efficiency of 90-95% is claimed with overall operating efficiencies of between 85% and 90%.

Electronic Servo System QB 368

A new automatic electronic remote control and positioning unit for the control of valves, dampers and other mechanical mechanisms is available from the Askania Regulator Co.

The basic units which make the com-

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. . . So, thousands and thousands of GATX cars are serviced each year for safe bulk transportation of a perishable food.

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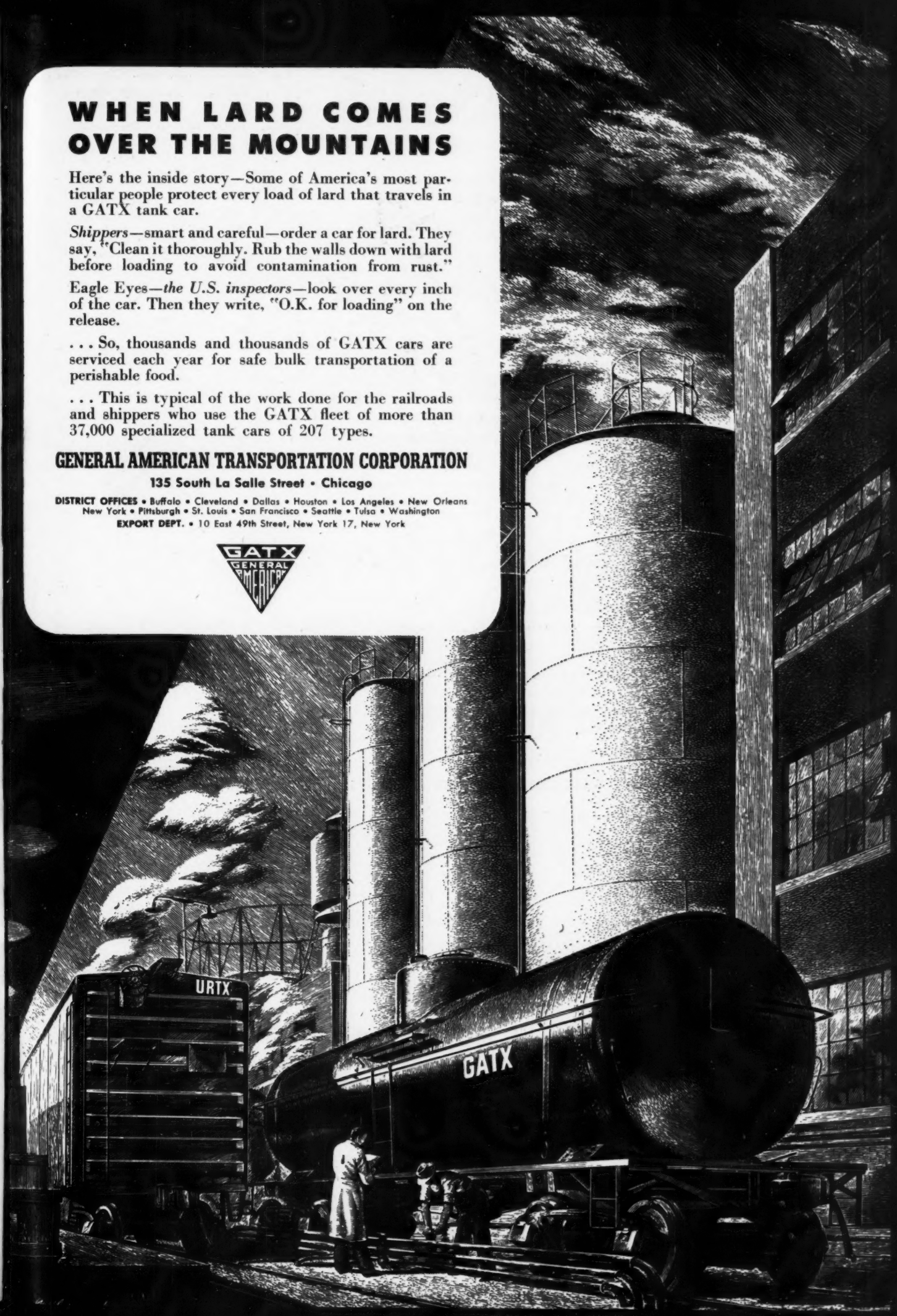


plete system can be combined in a variety of ways to produce systems to meet many industrial remote control needs are

1. A Transmitter: from which point any desired position of a remote receiver can be selected.

2. A Control Amplifier: which responds to the setting of the transmitter and accordingly controls the supply of power to the receiver.

3. A Receiver: which moves a load to the selected position.

The new Servo System, though operating with the high accuracy ordinarily available only with laboratory instruments, is constructed for heavy industry use.

Stepless Input Controller and Temperature Indicator QB 369

A new stepless input controller and temperature indicator has been developed by the Thermo Electric Mfg. Co. A sensitive thermostatic switch controlled by a knob on the instrument panel is incorporated in this new unit which can be set to regulate the current input into the heating equipment anywhere from 5—100% time "on".

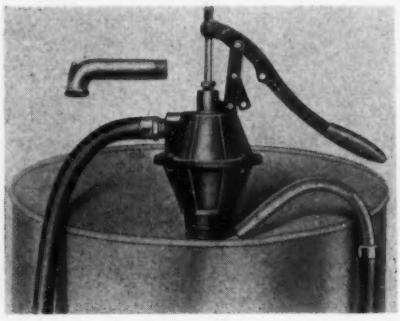
Unlike synchronous motor, rheostat and transformer type controllers this instrument will maintain a constant watt hour input and even temperature hour after hour, regardless of wide voltage fluctuations.

The instrument contains a dependable pyrometer calibrated in both to 2000°F and 1100°C.

Eight models of the instruments are available, covering current requirements of 115 and 230 volts, 10 to 35 amperes, 25 and 50/60 cycles AC, and for DC.

Hand Pump QB 370

Utilizing the diaphragm principle, the new hand pump of General Scientific Equipment Co. is being increasingly used



to remove liquids such as alcohol, kerosene, gasoline, motor oils, crude or fuel oil, anti-freeze, paint thinners, water and sprays from drums and barrels.

Fast pumping (fifteen gallons of light oil per minute), it requires no priming, has no leather or rotating parts to wear out, gives long, trouble-free service. Pump screws directly into drum and no separate bung bushings are required for 1½" or 2" drum openings. Waste is eliminated as a lift of the handle allows liquid to drain into drum and an automatic seal prevents evaporation. It is ideal for drums of 15 to 60 gallons capacity.

Diaphragm Control Valve QB 371

The primary design of the new line of Venturiflo diaphragm control valves incorporates a Venturi throat which insures the optimum in streamline flow characteristics. According to the Hammel-Dahl Co. these valves are designed primarily for high pressure applications. This type valve can be used to handle many difficult applications on the current fluid catalytic crackers, as well as many operations on the synthesis of oil from gas on current Fischer-Tropsch process plants.

The basic design has a cast bowl type angle body which will insure no increase in flow velocity as the fluid leaves the piping and enters the valve body. The valve body itself conforms to ASA face to center-line dimensions. The friction factor in this type valve body will average 5 in comparison to a friction factor of 9 in usual globe or double-seated control valves. The valve plug in all instances is top guided and centered in the seat both by the mechanical guiding and the flow of fluid through the valve body.

The seat is designed as a section of a Venturi throat, and insures minimum turbulence and an efficiency of operation comparable to that of a Venturi throat in flow measurement. The seat is of the

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VANCOUVER, B.C.: Willard Equipment Ltd., 860 Beach Ave.

In addition to the manufacturing facilities of the Chemical Equipment Division those of the Insulator Division are also available for handling ceramic problems in all branches of industry. General Ceramics & Steatite Corporation is therefore able to offer service covering all industrial applications of ceramic products.

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AND STEATITE CORP.
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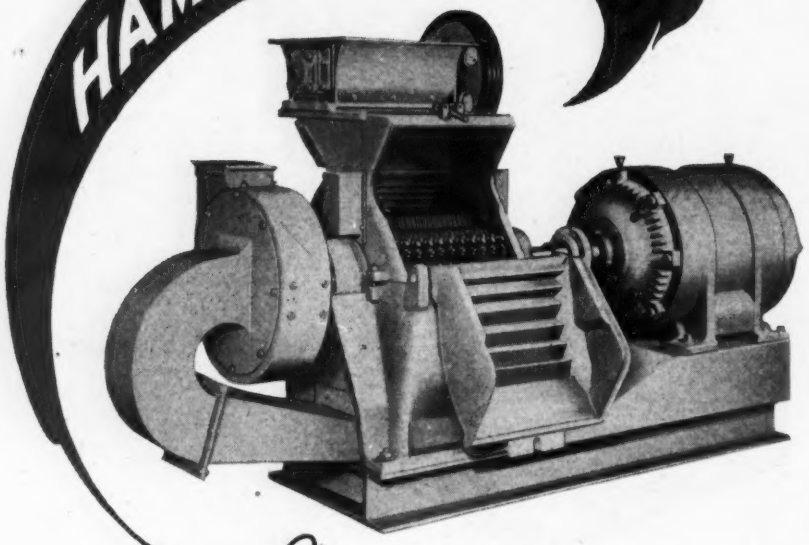

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SPROUT WALDRON
Manufacturing Engineers

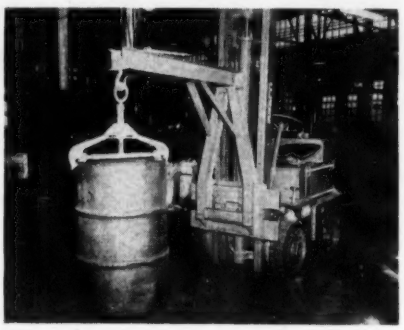
MUNCY PENNSYLVANIA

retained type and is lapped into the valve body, which eliminates the use of gaskets. It is retained by the companion flanges on the outlet piping. This construction eliminates any possibility of the seat cutting out. It prevents leakage between the seat ring and valve body.

Venturiflo valves are available in sizes from ½", through 1", with screwed ends, and 1" through 8" in flanged ends. They can be provided for 150#, 300#, 600#, 900# and 1500# ASA standard working pressure ratings. Valve bodies are available in cast iron, bronze, cast steel, Type 304 and 316 stainless steel as standard. Valves of this sort are presently being supplied on special applications under pressures as high as 30,000 psi and working temperatures between — 225° F. and plus 1000° F.

Drum and Barrel Hand Truck QB 372

Rocker pick-up and wheels of the new drum and barrel truck of Towsley Trucks, Inc. operate in the same arc, so that transition from loading to wheel-

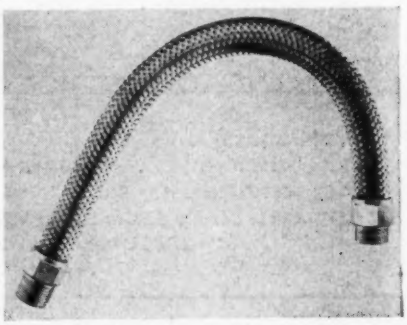


ing position is in one smooth, strain-free, rocker motion. There is no bump nor jar. The truck axle is located to put the load on the truck—not on the shoulders of the trucker—enabling one man to transport heavy drums or barrels.

Wheels are 10" x 2½", and can be furnished either semi-steel or molded-on rubber tread. Handle length of truck is 65"; overall width, 25"; weight, 80 lbs.

Monel Flexible Metal Tubing QB 373

Flexible metallic tubing made from monel metal for use where severe corro-



sion or high temperatures are encountered is now available from Titeflex, Inc.

Titeflex monel metal tubing is supplied

CHEMICO
CHEMICAL CONSTRUCTION CORP.

Look to this "seal of certainty" for

ACID RECOVERY

. . . PRODUCTION

. . . CONCENTRATION

A contract with CHEMICO is a *certainty* because CHEMICO guarantees the performance of its plants and processes as part of their contract. CHEMICO can predict plant performance with *certainty* because of the knowledge and experience gained in designing and constructing over 600 installations throughout the world.

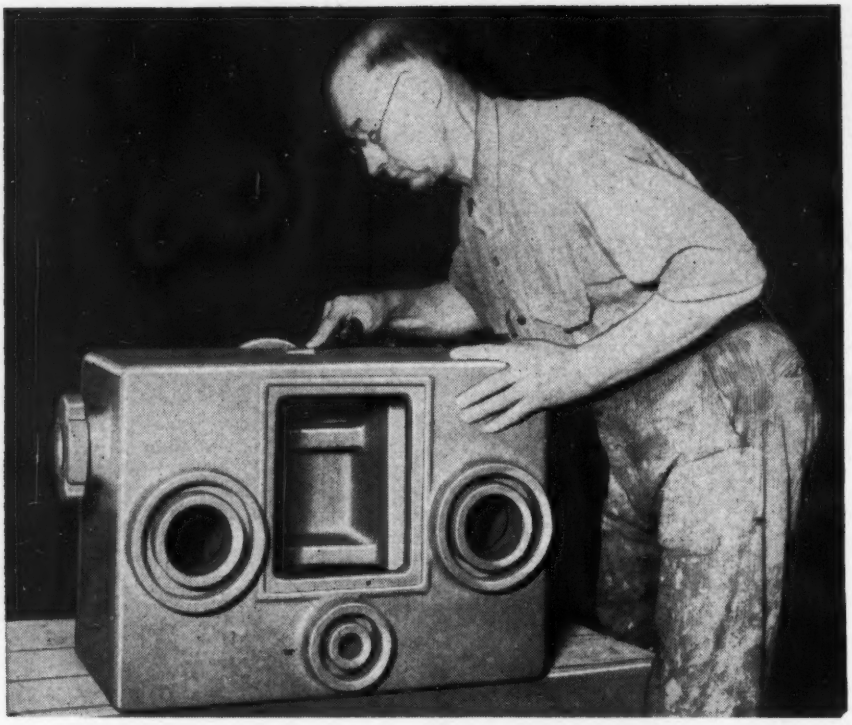
CHEMICO's complete service for the production, recovery or concentration of sulphuric acid or other acids embraces every element, including the development of new processes when necessary . . . the design and construction of plants . . . the installation of equipment . . . and initial training of the operating staff. Look to CHEMICO for authoritative assistance in acid production.

"Chemico plants are profitable investments"

CHEMICAL CONSTRUCTION CORPORATION

EMPIRE STATE BLDG., 350 FIFTH AVE., NEW YORK 1, N. Y.

European Technical Repr.: Cyanamid Products Ltd., Bretten[illegible] Lancaster Place, London W.C. 2, England. Cables: Chemiconst, New York



Craftsmen in Clay!

Special designs in acid-proof chemical stoneware require more than selected raw materials, careful forming and controlled processing. An intricately baffled box, or an unusually large tank made in one integral piece without seams or joints, takes plenty of experience and skill to form.

The craftsman's touch shows in Knight handbuilt equipment made to the customer's specifications. Forty years of first-hand experience in design, materials and processing plus the work of these "craftsmen in clay" bring you KNIGHT-WARE quality chemical equipment.

Knight-Ware Acid-Proof Sump

When problems arise involving the handling of acids, alkalies, gases and chemicals, the industry turns to Knight engineers and craftsmen for the most practical type of acid-proof equipment.

MAURICE A. KNIGHT
210 Kelly Ave.
Akron 9, Ohio

At the CHEMICAL EXPOSITION *visit us at Exhibit No. 53*

KNIGHT-WARE
CHEMICAL EQUIPMENT

for four temperature ranges, depending upon the melting point of the solder used in the seam of the innercore. The ranges are:

Type Number	*Melting Point of Solder*	*Flow Point of Solder*
S-175	358°F.	460°F.
S-176	640°F.	740°F.
S-129	1076°F.	1179°F.
S-196	1785°F.	1790°F.

In addition to its high temperature resistance, the new monel metal tubing has proved stronger than brass in breaking test.

Titeflex monel metal flexible tubing is supplied in the same sizes and with the same types of fittings as the standard Titeflex brass flexible tubing. It is furnished with either single or double bronze braid and brass fittings. Where special conditions require, monel fittings and monel braid can be supplied.

Axial Flow Fans QB 374

The new Axiflo axial pressure flow pressure fans of the Sturtevant Div. of the Westinghouse Electric Corp. has two basic types: the straight-through type or

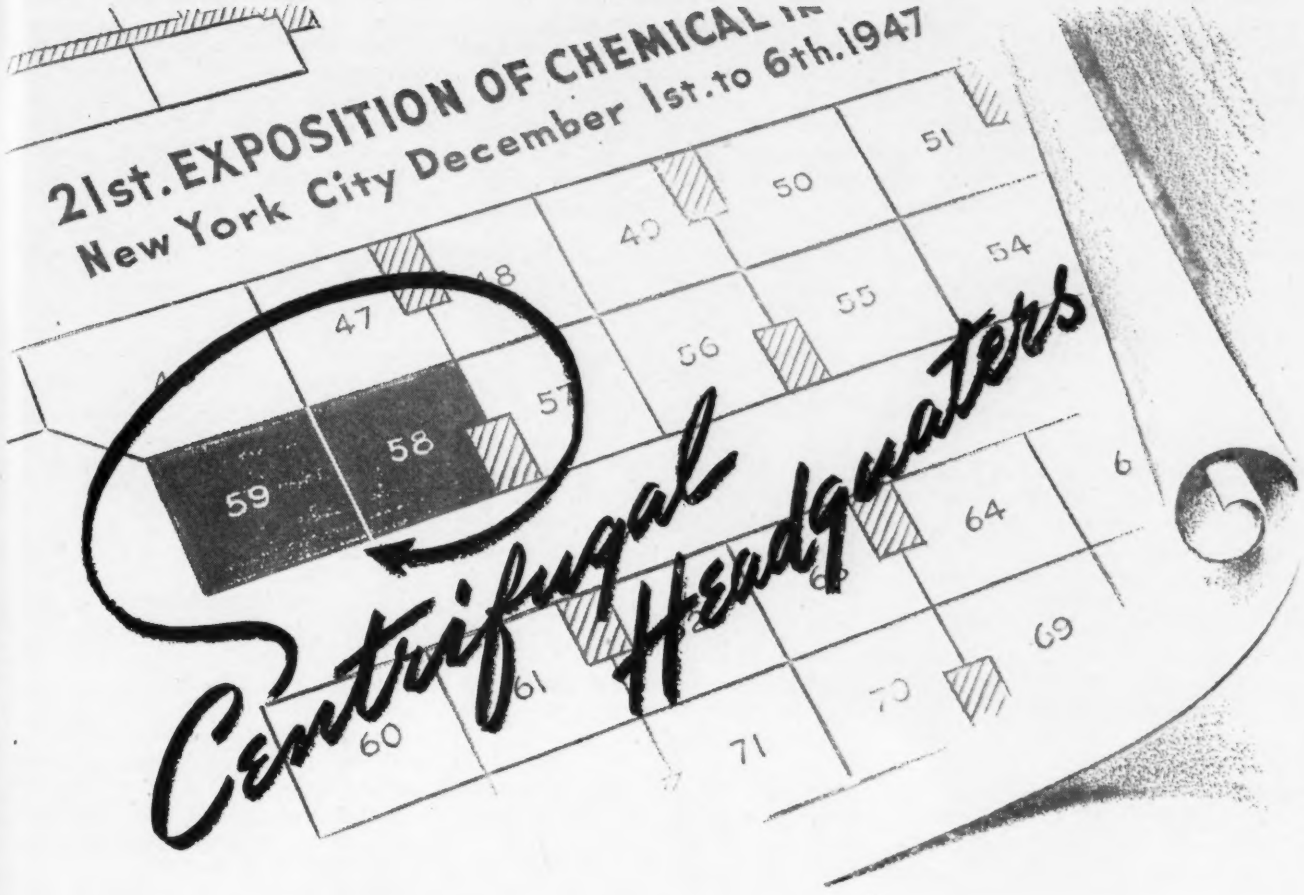
the convertible elbow type, both furnished with either the three bladed aluminum alloy wheel or eight bladed steel wheel. Applications for these fans include: air conditioning, dust and fume removal, machinery cooling, mechanical draft for combustion, industrtial drying and processing.

They are designed for either vertical or horizontal operation and have high mechanical and static efficiency combined with the large volumetric capacity to perform effectively against resistance of wind and duct systems. The convertible elbow type with motor, belt and bearings located outside the air stream, readily accessible for inspection and maintenance, is ideal for high temperature service.

Sizes vary from 18" to 72"; static-pressures from 0 to 3", and displacement from 2,000 to 115,000 cfm.

Pilot Plant Rotameter Kit QB 375

The flexible rotameter kit of the Brooks Rotameter Co. for measuring low flow rates consists of one fully shielded rotameter case, four interchangeable metering tubes, and 16 spherical floats, 4 each in



SHARPLES WILL PRESENT

THE SUPER · D · CANTER . . .
The new high-speed Solids discharge Centrifuge.

THE SUPER · D · HYDRATOR . . .
The new conception in automatic crystal drying equipment

THE SUPER · CENTRIFUGE . . .
The Centrifuge which develops the highest centrifugal force in commercial use.

THE D · 2 · CENTRIFUGE . . .
A high capacity disc bowl centrifuge.

●

THE SHARPLES CORPORATION
PHILADELPHIA · PENNSYLVANIA

CENTRIFUGAL AND PROCESS ENGINEERS

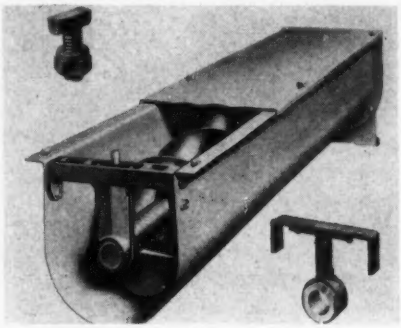
pyrex, aluminum, stainless steel and monel. With this combination, 16 liquid flow ranges are obtained, starting at 0.2 cc per minute and reaching a maximum of 200 cc per minute of liquid flow. 16 ranges in gases are also obtained, commencing at 10 cc per minute under standard conditions and extending to 7000 cc per minute. With the addition of two larger tubes and four floats, the top range can be extended to 0.20 gpm of liquid and to 0.60 cfm of gas.

● QB 376 The new *Continuous Combustible Gas Alarm System* of Davis Emergency Equipment Co., has an added feature which prevents tampering with its controls by unauthorized persons. To forestall tampering, a cover has been added to the control cabinet. Even when the cover is closed and locked, external buttons are accessible to silence the audible warning signal and to put the system back in operation after the vapor-air concentration is below the alarm point setting.

Adding to the system's efficiency are transparent words in the cover which become illuminated when their respective relays close.

● QB 377 The type 8 *Industrial Flowmeter* brings the precision features previously found only in the laboratory instruments of Commercial Research Laboratories, Inc. into a design suitable for industrial instrumentation. These features include molded guides, integral with the tapered pyrex glass metering tube which keeps the spool-shaped float on the exact centerline of the tapered tube.

● QB 378 A new design of *Cover and T-Head Bolt for the Spiral Conveyors* of the Jeffrey Mfg. Co. is flanged, providing a smooth rounded edge and adding the



stiffness which will permit the use of fewer bolts. Slotted holes in the cover permit it to pass over the T-head bolts without removing them. A quarter-turn to these spring-mounted T-head bolts securely locks the cover.

● QB 379 For some types of pumping operations a simple, wet pit type pump is required; with the use of which no submerged bearings are allowable. To meet this requirement the type "SW-O" *Overhead Bearing Pump* has been developed and added to the line of pumps made by Nagle Pumps.

The anti-friction bearings of this vertical shaft pump are supported in a pedestal attached to the floor plate. The shaft and bearings are individually lubricated and are supported in accurately machined end caps clamped into the pedestal by means of two readily accessible bearing studs. The pump can be belt-driven or motor-driven. The type "SW-O" is ideal for heavy liquids, hot liquids (up to 1000° F.), or for liquids containing solids.

● QB 380 Hewitt Rubber Division, Hewitt-Robins Inc., has resumed production of its top brand Maltese Cross *Fire and Chemical Hose*, withheld from manufacture during the war because of government restrictions.

A few of the features of Maltese Cross fire hose include:

Very special long-staple, thin gauge, high-tensile duck which makes the hose light in weight and easily coiled, combined with high burst resistance.

Special chemical treatment protects the duck against deterioration by mildew while the rubber cover eliminates the necessity of drying after use.

Highest quality rubber tube and cover compounded to withstand oiling for long periods without cracking.

Rubber cover protects the duck carcass from acid fumes and oil.

The Scales Tilt to Fulton

WATERPROOF BAGS

FOR SHIPPING CHEMICALS, CHEMICAL COMPOUNDS & POWDERED MATERIALS

FULTON WATER PROOF BAGS tip the scales with:

ECONOMY
lower cost per package.

SAFETY
moisture-proof and sift-proof Fulton Water Proof Bags provide safe handling for chemicals or any product where seepage, dusting, or absorbtion is a consideration.

FLEXIBILITY
adaptable to many products Fulton Water Proof Bags are easily handled, packed, and stored. Light but tough.

IDENTIFICATION
Fulton Artcraft Printing displays your name and brand to advantage — a plus advertising value.

FULTON BAG & COTTON MILLS

Manufacturers Since 1870

ATLANTA ST. LOUIS NEW YORK DALLAS NEW ORLEANS KANSAS CITY, KANS. MINNEAPOLIS DENVER

cut Shipping costs for 1872 firms through SIGNODE'S SIX-POINT SYSTEM!

Do you want to stop losses resulting from poor packing and shipping methods?

Then send for this man—a Signode packaging and shipping engineer! His broad experience through personal contact with hundreds of different shipping problems enables him to help you do a better job of packing and reinforcing, to reduce damage claims to the minimum, and to save you time, money and materials.

His sure-fire, time-tested method is *Signode's Six-point System of Planned Protection.* Thousands of firms, in a wide variety of enterprises, now use this system. It costs nothing to find out how it can help you, too. Fill in and mail the coupon today!

HERE'S SIGNODE'S SIX-POINT SYSTEM!

1. On-the-job survey of your shipping problems
2. Test-proved recommendation of right strapping
3. Test-proved recommendation of proper strapping tools
4. Recommendation of the right seal
5. Fast tool replacement service
6. Supplementary bulletin service to keep you abreast of developments in better shipping and packing methods

SIGNODE MEANS STEEL STRAPPING

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YOUR SHIPMENT SIGNODE AGAINST DAMAGE

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2662 N. WESTERN AVENUE, CHICAGO 47, ILLINOIS

C1

Signode Steel Strapping Company
2662 N. Western Avenue
Chicago 47, Illinois

We want to know how *Signode's Six-Point System of Planned Protection* can improve our packing and shipping methods.

Have a Signode engineer call ☐.
We ship..... in Cartons ☐ Crates ☐ Boxes ☐ Bags ☐ Bales ☐ Bundles ☐ In Carloads ☐ LCL ☐.

Name.....

Address.....

City.....Zone.....State.....

PACKAGING & SHIPPING

by T. PAT CALLAHAN

Airfreight Regulations

Official Airfreight Rules Tariff No. 1, naming local and joint rules on the regulations and charges applicable to airfreight between points in the United States, and between points in the United States and points in Canada, has been issued by Emery F. Johnson, Agent, Air Cargo, Inc., 910 Seventeenth Street, N. W., Washington 6, D. C. This Tariff was issued June 13, 1947, and became effective August 1, 1947.

In these columns we have offered general information concerning rules and regulations for the transportation of chemicals via rail, truck, and water; and now that air transportation is becoming a very definite factor in the movement of commodities, we feel that general information concerning rules and regulations for airfreight will be of interest to the producers and shippers of chemical products.

We quote the following rules and regulations taken from this Tariff which, we believe, will be of particular interest to shippers:

2.2 *Packing and Marking Requirements*

(a) Shipments must be so prepared or packed as to insure safe transportation with ordinary care in handling.

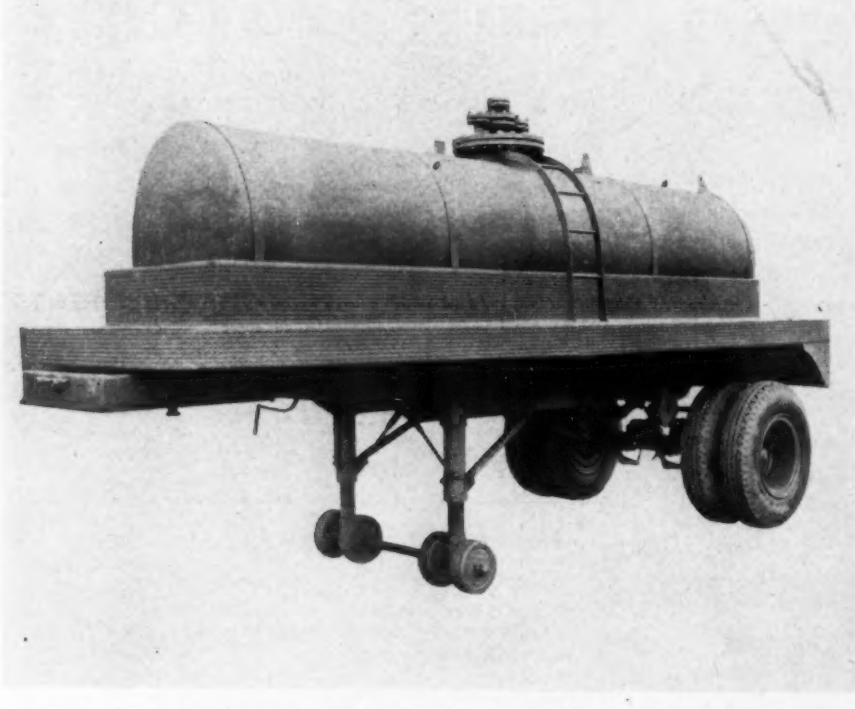
(b) Any article susceptible to damage by ordinary handling must be adequately protected by proper packing and must be marked or bear appropriate labels.

(c) Any article susceptible to damage as a result of any condition which may be encountered in air transportation, such as high or low temperatures, high or low atmospheric pressures, or sudden changes in either, must be adequately protected by proper packing and any other necessary measures.

(d) Each piece must be legibly and durably marked with the name and address of the consignor and consignee.

(e) Pieces with a floor-bearing weight in excess of 100 pounds per square foot must be provided with a skid or base, suitable for use in available aircraft, which will reduce the floor-bearing weight to 100 pounds or less per square foot. Such skid or base must be furnished by the consignor and included in the gross weight of the piece.

Trailer Tank for Hauling Acids



A 1200-gallon lead-coated tank, which meets the ICC MC310 specifications, mounted on a Fruehauf trailer chassis, is used by Chas. Lennig & Co., for hauling acids. Often, in "shuttle" service, two trailers are handled by only one truck-tractor and driver. Tank equipment is supplied by Republic Lead Equipment Co., Cleveland.

CASE HISTORY NO. 20

One in a series of factual experiences telling how and why various American manufacturers use St. Regis Packaging System.

COST COMPARISON
(per ton)

	100-lb. cloth bags	50-lb. paper bags
Container cost per ton	$6.00	$3.28
Labor cost per ton	.66	.40
Total bag and labor cost per ton	$6.66	$3.68
Saving per ton, paper over cloth		$2.98

CLASS OF PRODUCT PACKED

CEMENT	FERTILIZER
CHEMICALS	FOOD
FEEDSTUFFS	MINERALS ✓

PRODUCT CHARACTERISTICS

ABRASIVE	GRANULAR ✓
CORROSIVE	HEAVY ✓
DELIQUESCENT	HYGROSCOPIC
FLUFFY	LIGHT
FREE-FLOWING ✓	VISCOUS

St. Regis Packaging Systems are designed to meet a wide range of product requirements and plant layouts. Packers are available in a variety of sizes and types, with filling speeds as high as twenty-four 100-lb. bags per minute — with one operator. Nearly 400 commodities—rock products, fertilizers, chemicals, foods, and feeds — are now being packaged in sturdy, low-cost multiwall paper bags.

To manufacturers who want to cut packaging costs

Multiwall Paper Bags Bring Saving of 44% at The United States Graphite Co.

Now their packaging output is limited only by the capacity of the mills to grind the material!

"It has been a remarkable change," say officials of The United States Graphite Company in Saginaw, Michigan.

In 1944 this company changed from 100-lb. cloth bags to a St. Regis Packaging System to pack various grades of graphite in 50-lb. multiwall paper valve bags. The company is now using a total of seven St. Regis valve bag filling machines.

One of the main factors that brought about the change to multiwall paper bags was the promise of high hourly production. Under the old inefficient system, packaging output per hour was low . . . labor costs high. Not only that, but container costs were high. Cloth bags cost $6.00 per ton of material packed . . . Multiwalls only $3.28.

According to company officials, the results achieved by the St. Regis System are:

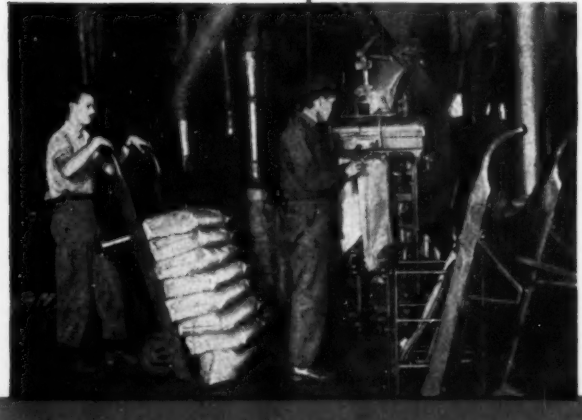
- A 66% increase in packaged output, using the same number of men.
- Per-ton packaging costs dropped 44%.
- Container costs reduced 45%.
- Labor costs reduced 39%.
- Preference by workers and customers for the easily-handled 50-lb. multiwall paper bag.
- Cleaner, neater, protective packages.

"It's an exceedingly satisfactory operation," say company officials, "and one that other industries may well duplicate."

Is *yours* such an industry? Mail the coupon for an illustrated folder with more details of this Case History. Learn how a St. Regis Packaging System can improve your packaging operation.

The high-speed 152-PB valve bag filling machine cuts labor costs and provides a cleaner packaging operation.

Multiwall paper bags are clean and easy to handle . . . they protect the product during shipment.



St. Regis MULTIWALL PAPER BAGS

MULTIPLY PROTECTION • MULTIPLY SALABILITY

ST. REGIS SALES CORPORATION

(Sales Subsidiary of St. Regis Paper Company)

NEW YORK 17: 230 Park Ave. CHICAGO 1: 230 No. Michigan Ave.

BALTIMORE 2: 1925 O'Sullivan Bldg. SAN FRANCISCO 4: 1 Montgomery St.

ALLENTOWN, PA.: 842 Hamilton St.

OFFICES IN OTHER PRINCIPAL CITIES — IN CANADA: ST. REGIS PAPER CO. (CAN.) LTD. MONTREAL • HAMILTON • VANCOUVER

Mail this coupon for complete story

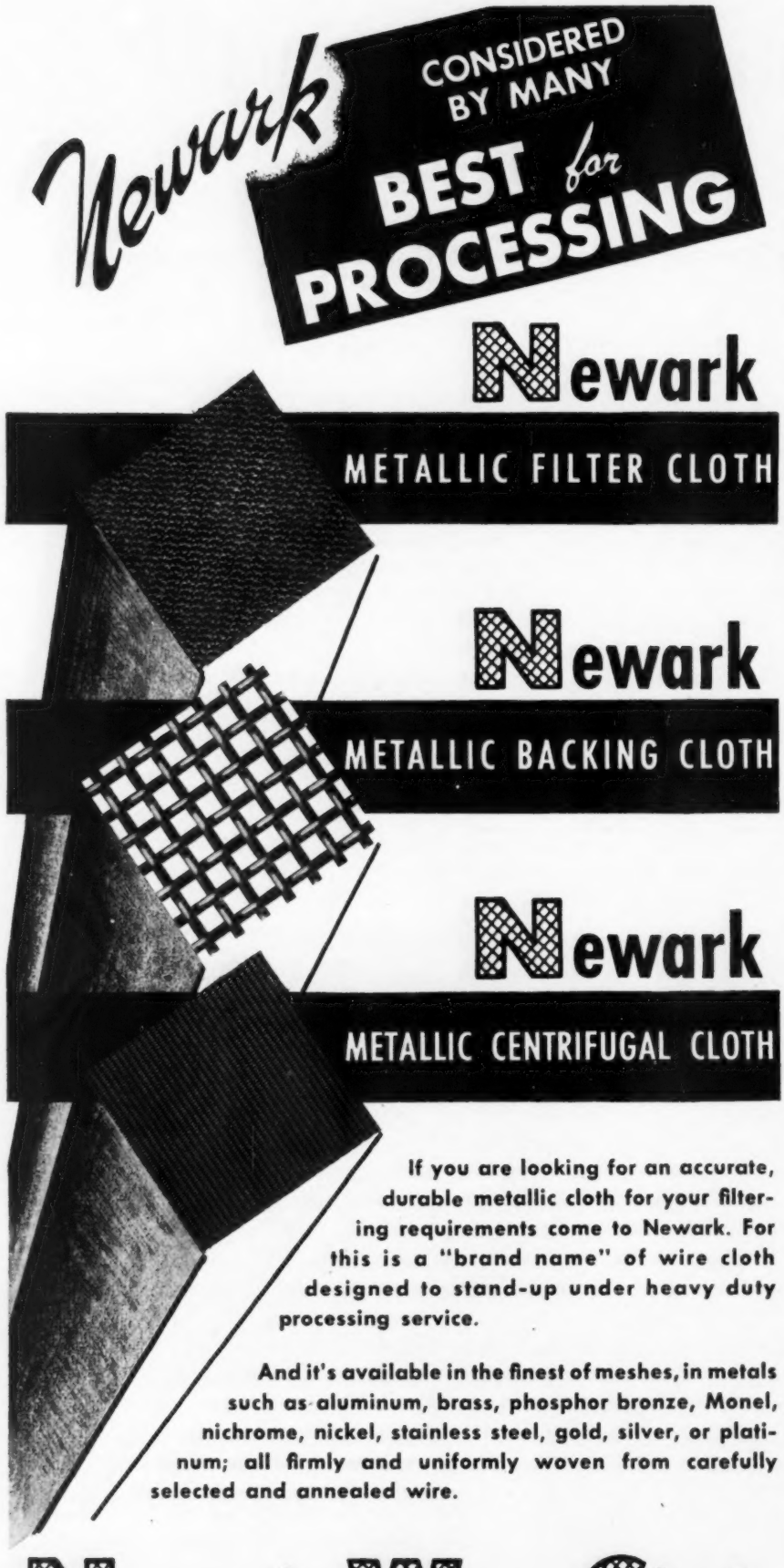
ST. REGIS SALES CORPORATION
Dept. FI, 230 Park Avenue, New York 17, N. Y.

Without obligation, please send me full details regarding "Case History" No. 20, outlined above.

NAME_____

COMPANY_____

ADDRESS_____



If you are looking for an accurate, durable metallic cloth for your filtering requirements come to Newark. For this is a "brand name" of wire cloth designed to stand-up under heavy duty processing service.

And it's available in the finest of meshes, in metals such as aluminum, brass, phosphor bronze, Monel, nichrome, nickel, stainless steel, gold, silver, or platinum; all firmly and uniformly woven from carefully selected and annealed wire.

Newark Wire Cloth COMPANY

345 VERONA AVENUE • NEWARK 4, N. J.

(f) Magnetic material will be accepted only when plainly marked *"Magnetic Material"*.

2.4 *Shipments Subject to Special Conditions*

(a) 1. Any shipment of a declared value exceeding $25,000 will be accepted only upon advance arrangement.

2. Pennsylvania Central Airlines Corp. will accept a shipment valued in excess of $25,000 only when the actual value is stated on the Airbill, and advance arrangements have been made with the carrier.

(b) Pieces of unusual shape, or weighing in excess of 200 pounds, or more than 20 by 24 by 44 inches, or whose combined length and girth exceed 132 inches, will be accepted only by advance arrangement.

(c) Shipments liable to impregnate or otherwise damage equipment or other shipments will be accepted only upon advance arrangement.

(d) Shipments requiring special devices for safe handling will be accepted only when such special devices are provided and operated by and at the risk of the consignor or consignee.

(e) *Animals,* reptiles, birds, poultry and fish, when alive, will be accepted only upon advance arrangement and only when harmless, inoffensive, odorless and requiring no attention in transit.

(f) *Film* must be packed in a sparkproof metal container marked with a yellow caution label to disclose the inflammable nature of the shipment.

(g) *Small Arms Ammunition* will be accepted only over the lines of Braniff Airways, Inc., Continental Air Lines, Inc., Chicago & Southern Air Lines, Inc., Inland Air Lines, Inc., Mid-Continent Airlines, Inc., Pennsylvania Central Airlines Corp., Southwest Airways Co., and Western Air Lines, Inc. and only when packed in pasteboard or other inside boxes packed in securely closed strong wooden boxes, fiberboard boxes, or metal containers and when each outside package is plainly marked: *"Small Arms Ammunition"*. Small arms ammunition includes all fixed ammunition such as is used in pistols, revolvers, rifles, shot guns, and similar firearms or in machine guns with non-explosive bullets, and consist usually of a paper or metallic cartridge case, the primer, and the propelling powder charge, with or without shot, bullet; the component parts necessary for one firing being all in one assembly.

(h) *Radium and Radioactive Materials* will be accepted only over the lines of Braniff Airways, Inc., Delta Air Lines, Inc. and Pennsylvania Central Airlines Corp. and only when such shipments do not emit gamma or other rays in excess of the rating for one gram equivalent of radium. Radium and radioactive materials must be encased in lead of thickness prescribed by "Committee on Standard of Radioactivity—National Research Council" for full protection of undeveloped films at 30 feet (developed films unaffected) and full protection of all persons and must be marked "Do not place in same compartment with undeveloped films or mail".

(i) *Radium and Radioactive Materials* will be accepted or transported by Chicago & Southern Air Lines, Inc., Delta Air Lines, Inc., Inland Air Lines, Inc., Mid-Continent Airlines, Inc., Pennsylvania Central Airlines Corp., South-

PROMPT DELIVERY

HERCULES *Aero*

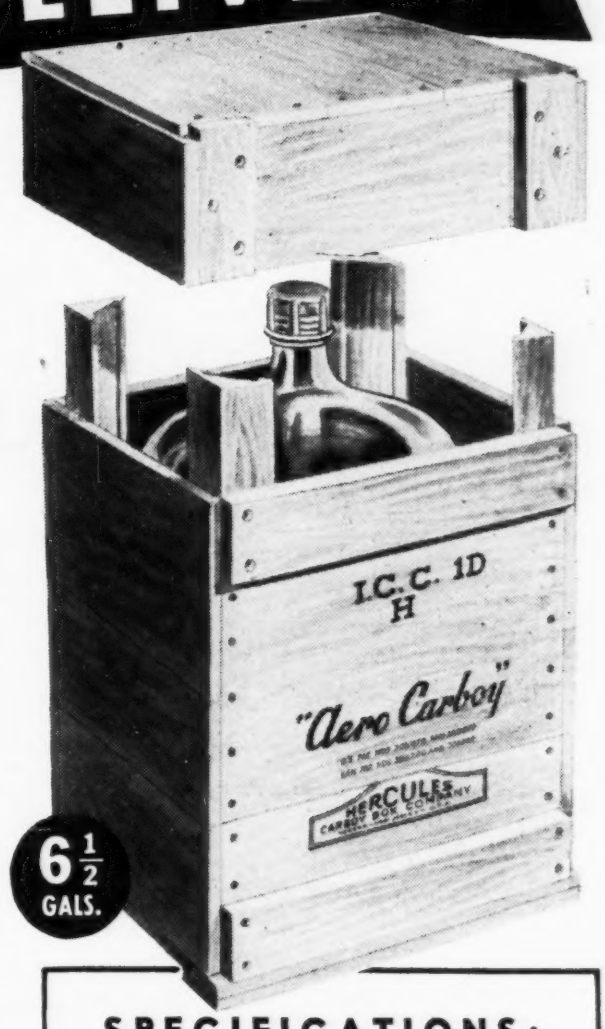
(RUBBER CUSHIONED)

CARBOY BOXES

6½ gals. normal capacity (7 gals. overflow). **Built to withstand an internal pressure of 10 lbs., this new rubber cushioned, completely enclosed, wooden carboy box complies with I.C.C. Regulations for transportation of the 3 principal mineral acids, Hydrochloric, Sulphuric, Nitric. Specific application should be made for other uses.**

These Features:

1. Flat cover—no protruding neck—enables boxes to be piled one on top of another for convenient storage. (See illustration at left.)
2. Corner posts provide a convenient handle so that one man can handle carboy. (See illustration at left.)
3. Smaller size and lighter weight makes for easier handling and shipping.



SPECIFICATIONS:

BOX SIZE: 13¾"x13¾"x22" Including Hood (I.D.)

WEIGHT: App. 26 lbs. (Box); App. 14 lbs. (Bottle)

CARBOY: 6½ gals. norm. cap. (7 gals. overflow)

CAP: Regulation Polystrene Cap Supplied

COMPLIES WITH CLASSIFICATION I.C.C. 1-D

Other HERCULES *Aero* TYPE RUBBER CUSHIONED CARBOY BOXES Comply with Classification I.C.C. 1-A

5 GALS.

SPECIFICATIONS

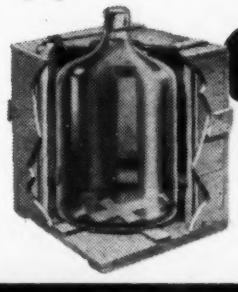
SIZE: 12½"x12½"x17¼" (I.D.)

WEIGHT: Approx. 23 lbs. without bottle

CARBOY: 5 gallons or 42 pints

STYLE: No. 6

Also available with hinged top and in 1, 2, 3 gals.



13 GALS.

SPECIFICATIONS

Size: 17½"x17½"x22" (I.D.)

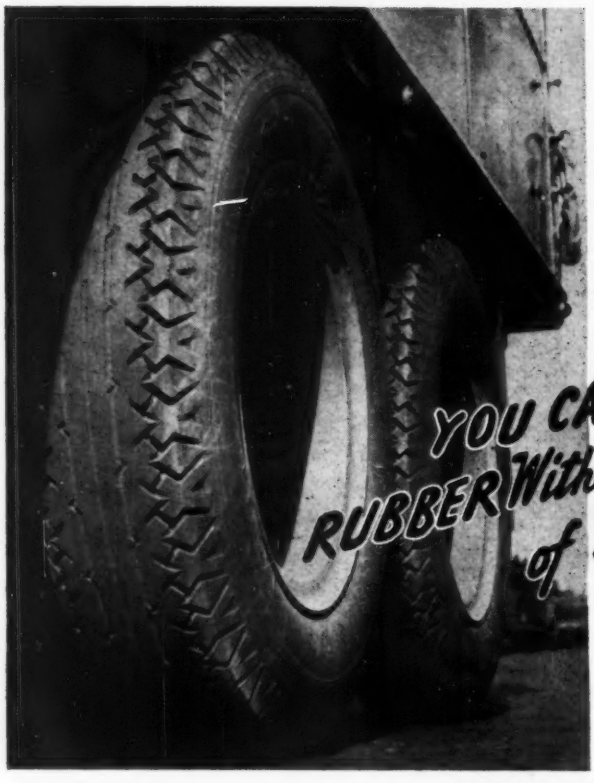
WEIGHT: Approx. 45 lbs. without bottle

CARBOY: 13 gallons

STYLE: No. 15

NATIONAL BOX & LUMBER COMPANY

HOME OF HERCULES CARBOY BOXES • NEWARK 5, NEW JERSEY



Sulphur is serving the rubber industry from the manufacture of rayon threads to vulcanization. It helps to make the tires for travel over the country's highways and to manufacture rubber for countless uses in homes and industry.

SOME OF THE PRODUCTS REQUIRING SULPHUR

ACIDS	LUBRICANTS
CHEMICALS	MATCHES
CLEANING FLUIDS	MEDICINE
DRUGS	PAINTS
DYESTUFFS	PAPER
EXPLOSIVES	PETROLEUM PRODUCTS
FABRICS	PLASTICS
FERTILIZERS	PROCESSED FOODS
FILM	REFINED METALS
FOOD PRESERVATIVES	REFRIGERANTS
FUMIGANTS	RESINS
FUNGICIDES	RUBBER
GASOLINE	SYNTHETIC RUBBER
GLASS	SOAP
GLUE	SODA
GLYCERIN	SOLVENTS
INSECTICIDES	STEEL
KEROSENE	SUGAR
LEATHER	TEXTILES

Sulphur has an important role in the preparation of both natural and synthetic rubber. In the form of Sulphuric acid, it coagulates the synthetic rubber from soap suspension solutions. Moreover, it is essential in the vulcanization of both natural and synthetic rubber.

The manufacture of rubber is but one of the many ways in which this invaluable mineral is aiding industry. Freeport's reserves of this essential product combined with modern mining methods assures a dependable supply.

FREEPORT SULPHUR COMPANY

Offices: 122 E. 42nd St. • New York 17, N. Y.
Mines: Port Sulphur, La. • Freeport, Tex.

SULPHUR SERVES INDUSTRY

west Airways Co., United Air Lines, Inc., and Western Air Lines, Inc., only as follows:

(a) Synthetic radio isotopes when packaged in a container not having more than 15 milliroentgens per hour radiation at the surface of the container. The shipment shall be so identified and should not be placed in the same compartment with mail or undeveloped film.

(b) Any other radioactive material when completely encased in an inner lead container the walls of which are at least 1/32 of an inch thick, and which emits no radiation of any harmful intensity at the surface of the container. The shipment shall be plainly marked as to its contents.

(j) Shipments requiring special attention, protection or care en route will be accepted only upon advance arrangement.

2.5 *Shipments Not Acceptable*

(a) *Explosives,* including fireworks and explosive devices will not be accepted, *except* as provided in Rule 2.4 (g).

(b) *Inflammable Liquids,* including all liquids with a flash point of 80° F. or less (ASTM Method D-56-36) or liquid inflammable material named in paragraph (f) of this rule will not be accepted. The following will not be accepted under any circumstances:

Carbon bisulphide
Ethyl chloride
Ethylene oxide
Nickel carbonyl
Zinc ethyl
Spirits of nitroglycerine in excess of one percent by weight.

(c) *Inflammable Solids,* including all solid substances which are liable to cause fires through friction, through absorption of moisture, or through spontaneous chemical changes, will not be accepted.

(d) *Oxidizing Materials,* such as chlorates, permanganates, peroxides, or nitrates, which yield oxygen readily to stimulate combustion will not be accepted.

(e) *Corrosive Substances,* including strong acids and alkalis, or wet storage batteries or other devices containing such substances will not be accepted.

(f) *Compressed Gases* with a gauge pressure exceeding 25 pounds per square inch at 70° F., or any inflammable liquid material having a vapor pressure (ASTM Method D323-43) exceeding 40 p.s.i. absolute at 100° F., will not be accepted. (See Exception.)

Exception: Liquefied Carbon Dioxide in compressed gas cylinders bearing Interstate Commerce Commission identification markings 3A-1800 or 3E1800 or higher will be accepted for transportation over the lines of AA or PCA.

(g) *Vaporizing Substances* which gives off dangerous or irritating vapors, including substances which give off such vapors when exposed to heat or moisture, will not be accepted.

(h) *Radium or Radioactive Materials* will not be accepted, *except* as provided in Rule 2.4 (h) and (i).

(i) Shipments not expressly covered by these rules which would be likely to cause damage to other shipments, equipment, crew, or passengers, or whose carriage is prohibited by law, will not be accepted.

When we say Continental cans serve *behind* the labels of America's finest products, we are not overlooking the labels, themselves. Those labels we *lithograph*, that is!

No doubt about it, Continental labels serve, too! They make packages attractive—easier to sell. A smart design, faithfully reproduced by modern lithography, stands out as effective point-of-sale advertising for the product.

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Materials Handling Exposition

The National Materials Handling Exposition will be conducted for the second year in the Public Auditorium, Cleveland, O., Jan. 12-16, inclusive.

One hundred and fifty-four exhibitors, 60 per cent more than the number represented at the first show, already have contracted for booth space. The exposition, which attracted more than 12,000 top management executives last January, will occupy almost 200,000 square feet of exhibit space, nearly three times the previous area, and thus will rank among the top fifteen national industrial expositions, said Edwin J. Heimer, president of Barrett-Cravens Co., Chicago, and chairman of the exposition committee.

The show will run for five days, and all systems of materials handling will be on exhibition to make the showing completely representative, he added.

Educational features will include a Conference on Materials Handling, which will be held concurrently with the exposition; a Materials Handling Theater, which will present films on handling subjects; and an institutional presentation of materials handling equipment and systems in addition to those shown in the commercial exhibits.

Virtually all booths will be larger in area to permit demonstration of equipment in motion. Increases range from two to five times previous areas used. To accommodate the larger booth dimensions, the exposition has been moved to the Lakeside exposition halls of the Auditorium.

"After more than two decades of effort," said Heimer, "industry attention was focused for the first time, at the initial exposition, on materials handling as a science designed to cut production and distribution costs. This year, with many new exhibitors represented, it will be possible for businessmen to compare different systems of materials handling in addition to different manufacturers' equipment.

"Recent surveys have indicated that the handling of materials, a completely nonproductive operation, constitutes from 12 to as much as 50 per cent of total labor costs in various industries. The over-all national average has been placed in the neighborhood of 22 per cent of all labor costs.

"If industry is to avoid pricing itself out of the market, this staggering burden of billions of dollars spent unproductively must be cut down. Raw materials and labor costs are at all-time highs and the indices are mounting. Mechanization of handling is the only area in the costs picture where substantial savings can be effected."

Clapp & Poliak, Inc., 350 Fifth Avenue, New York 1, N. Y., manages the exposition. Information about the show, the program of the conference and hotel ac-

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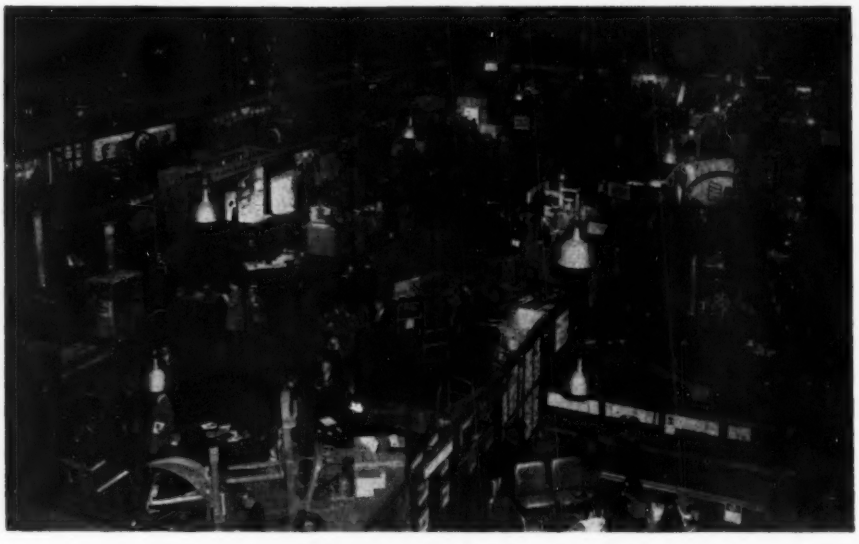
commodations may be obtained from that office.

Among the many types of equipment to be exhibited at the show are hand trucks, lift trucks, conveyors, hoists, monorails, portable elevators, stacking units, tractors, trailers, fork trucks, skids and pallets, and their respective accessories.

Serving with Heimer on the exposition committee are Lloyd Backart, president, Rapids-Standard Co., Inc., Grand Rapids, Mich.; Ezra W. Clark, materials handling consultant, Battle Creek, Mich.; Irving B. Hexter, publisher, *Flow* magazine, Cleveland, and R. L. Wolter, sales manager, Automatic Transportation Co., Chicago.

Hexter is chairman of the program committee for the conference and Clark, vice-chairman. The motion picture committee is composed of Gordon J. Berry, vice-president, Electric Products Co., Cleveland, chairman; R. G. Redhead, same company, vice-chairman, and L. P. Aurbach, vice-president, *Flow*.

E. I. Burke, manager of shipping, Republic Steel Corp., Cleveland, is chairman of the banquet committee, and Elmer F. Twyman, general manager, Automatic Transportation Co., vice-chairman. The publicity committee is composed of Wolter, as chairman; Milton M. Enzer, assistant to the president, Yale & Towne Manufacturing Co., New York; Paul O. Ridings, president, Ridings-Ferris, Inc., Chicago, and Ed Greif, Banner & Greif, New York.



The second Materials Handling Exposition, to be held in Cleveland, January 12-16, will be much larger than the first one, shown here.

Phosphorus Handling

The MCA has announced the publication of Chemical Safety Data Sheet SD-16 on Phosphorus, Elemental, the sixteenth in the series of chemical product safety manuals being prepared by it. Designed for supervisory staffs and management, the manuals concisely present essential information for the safe handling and use of chemical products.

Chemical Safety Data Sheet SD-16—Phosphorus, Elemental—may be obtained at 20 cents per copy from the Manufacturing Chemists' Association, 608 Woodward Building, Washington 5, D. C. Send remittance with each order.

MODEL MG "BOND"

Semi-Automatic Packer, Gross Weigher, Volume Filler

For all types of powdered and granular material

Packaging powders or granular materials in snug cartons or containers with reduced openings is a real problem to many manufacturers of cosmetics, chemicals, drugs, and foods. The Model MG "Bond" Packer is especially designed to overcome this stumbling block. And, it may be optionally equipped as a gross weigher of exceptional accuracy or a speedy volume filler.

The MG "Bond" is a single station, semi-automatic machine capable of handling packages ranging in size up to 14 inches high with a base up to eight inches square or eight inches in diameter. A single operator can fill 25 containers a minute.

Also manufactured by *US* are many other packaging machines, of from one to four stations, either semi or fully automatic. Do you have a problem in packaging? *US* Automatic can fill in the answer.

Send U.S. details on any of your packaging problems —we have the machines and the engineering background to help solve them.

US *Automatic Box Machinery Co. Inc.*

SALMON...the second Alaskan gold rush!

OUR artist has interpreted the second Alaskan gold rush by picturing a miner washing a salmon from his gold pan.

But actually salmon has paid more dollars to Alaska than gold ever did.

Even before the turn of the century, enterprising men were processing and marketing Alaskan salmon in hand-made, hand-filled cans.

But between 1910 and 1941 the dollar volume of the Alaskan salmon pack increased more than 500 per cent—because of improvements in cans and canning machinery.

Today salmon is more profitable to Alaska than all of her other industries put together. The principal factors in this second Alaskan gold rush were American Can Company's contributions to the industry.

The perfection of the collapsible can reduced the cost of shipping cans to Alaska by nearly twenty to one.

Constant improvement in can-filling and can-closing machinery has meant faster packing of a superior product.

Today, salmon packers are getting more than 12 times as much cash every year *from* Alaska than Alaska cost the U. S. in 1867. Here is another dramatic demonstration that *those who do business with Canco profit.*

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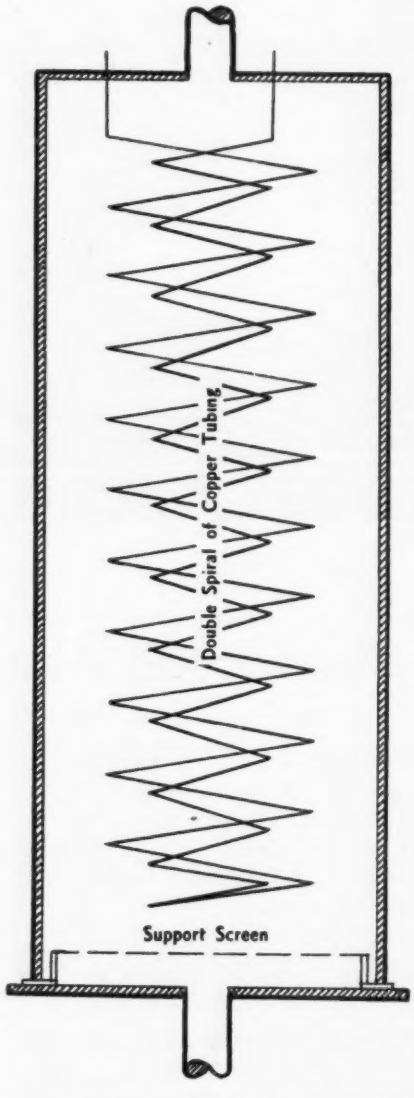
PLANT OPERATIONS NOTEBOOK

Carbon Adsorber Protects Oil-Sealed Vacuum Pump from Solvent Vapors

by N. W. Franke, M. W. Kiebler and W. E. Wehn
Coal Research Laboratory
Carnegia Institute of Technology
Pittsburgh, Pennsylvania

THE activated carbon adsorber described here has been very successful in protecting a mechanical vacuum pump from organic vapors liberated in a vacuum drum drier. The drier is a double-drum laboratory model with 2 sq. ft. of surface and is used to remove the solvents from a solution containing 60% of normally solid organic acids, 30% of methyl ethyl ketone and 10% of water, and traces of acetic acid. This operation requires a vacuum 1″ Hg, produced with a rotary oil-sealed pump. Originally the vapors were drawn from the drier through a water-cooled condenser and directly into the pump. With this arrangement most of the ketone and water condensed in the pump oil. After a few hours of operation the condensed vapors had displaced most of the oil and the pressure in the drier rose above 4″ Hg, making it necessary to change the pump oil every few hours in order to operate the drier. Also, after several weeks the pump became noisy and examination showed that corrosion of the working parts was taking place due to the water and small amounts of volatile acids which were condensing in the pump. These factors made it quite evident that some means would have to be adopted to prevent the vapors from getting into the pump and a carbon adsorber was selected as being the best.

The adsorber was made in the laboratory's shop out of readily available materials. The vessel itself is a piece of seamless steel tubing 10″ O.D., ¼″ wall thickness and 27″ long. A circular plate ⅜″ thick was welded onto the top of this and a flange 12⅜″ O.D. and ⅜″ thick was welded to the other end. This lower end is closed by a blind flange ⅜″ thick, held on by ten 5/16″ bolts. The seal is made with ordinary steam gasket material. The coiling coil is a double helix made of ⅜″ copper tubing, the outer one being 6½″ O.D. with a 2″ pitch and the inner one 3½″ O.D. with a 1½″ pitch. The two ends of the coil pass through two holes drilled in the top of the vessel and are sealed in place by brazing. The gas inlet and outlet are 1″ IPS pipe couplings welded into the ends. Another steel pipe welded into the top for a compound pressure-vacuum gage is also used to introduce a thermocouple well. The carbon is held up off of the bottom of the vessel



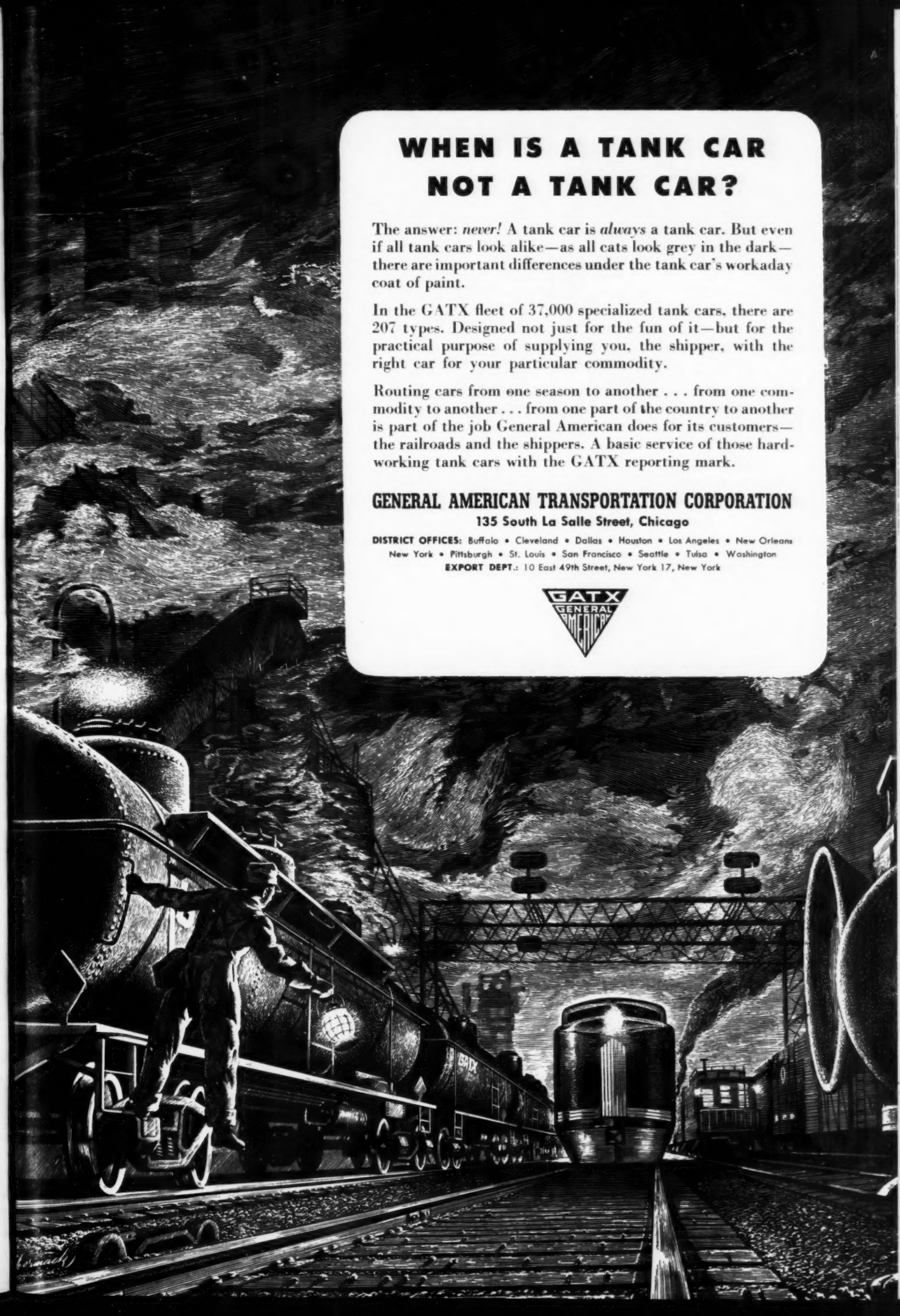
by a sheet of canvas filter cloth which rests on a 1″ screen, which in turn rests on a support ring 1″ high. The support ring and screen leave about 1/16″ clearance to the wall of the vessel. The canvas is stretched over the screen and down around the ring, sealing the gap between the vessel and the support ring.

The vessel is loaded by placing a stopper in the inlet line at the top, inverting the vessel, and dumping in the carbon. A layer of coarse and than a layer of fine Fiberglas is placed on top of the carbon, and the screen support with the cloth over it is pushed into place. This filter bed is inserted to prevent carbon fines, and dust from the drier, from getting into the pump. The lid is then bolted on and the vessel is ready for use. The line from the drier is connected to the top of the vessel and the line to the pump is connected to the bottom, the bottom being the end with the flanged closure. While the system is in operation, cooling water is run through the coils to remove the heat of adsorption. When the carbon is saturated it takes longer to evacuate the system and the vacuum is not as good as when the carbon is fresh. The transition from good adsorption to none is very sharp since the adsorption zone in the carbon is quite thin. To reactivate the carbon, 80 psig. steam is run through the copper coil and 20 psig. steam is run through the carbon bed. After an hour the direct steam is turned off and the carbon is dried out by connecting the adsorber to an aspirator and leaving the steam run in the coils. Practice has been to dry the carbon for 3 hours but this can be reduced to a much shorter period if necessary.

The activated carbon used in this adsorber is a granular gas adsorption grade produced by the Pittsburgh Coke and Chemical Co. The vessel holds about 1 cu. ft. of this carbon which amounts to about 30 pounds. A careful balance was made on the material evolved during a typical reactivation cycle. Forty-four pounds of steam was used to flush the carbon and 10 pounds of methyl ethyl ketone, water and acids were desorbed. The carbon has been in use about a year and a half, and in that time the 30 pounds of carbon has adsorbed and desorbed over 300 pounds of material and has been reactivated over 40 times. As yet it shows no sign of losing activity.

This adsorption system has completely eliminated all of the troubles described at the beginning and enables a lower vacuum to be obtained in the drier. In fact, when it was found that the system worked so well, a second adsorber was built to allow continuous operation of the drier. The one is on stream while the other is being reactivated. Because there had been some corrosion of the exposed steel at the inlet end of the first adsorber the inside of the second was coated with tin. To simplify the tinning operation, both ends were flanged instead of just one as in the first adsorber.

The Nomograph-of-the-Month will be found on Page 872.



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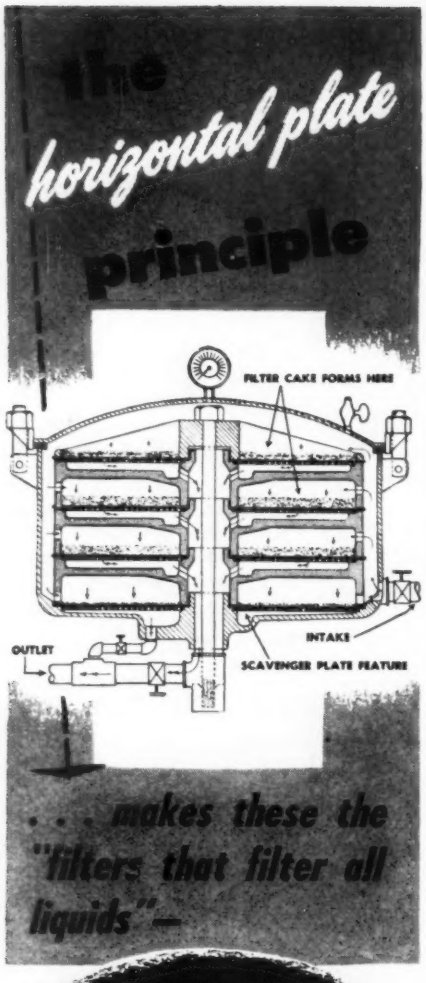
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Estimation of Relative Volatility

by D. S. Davis
Government Laboratories
University of Akron
Akron, Ohio

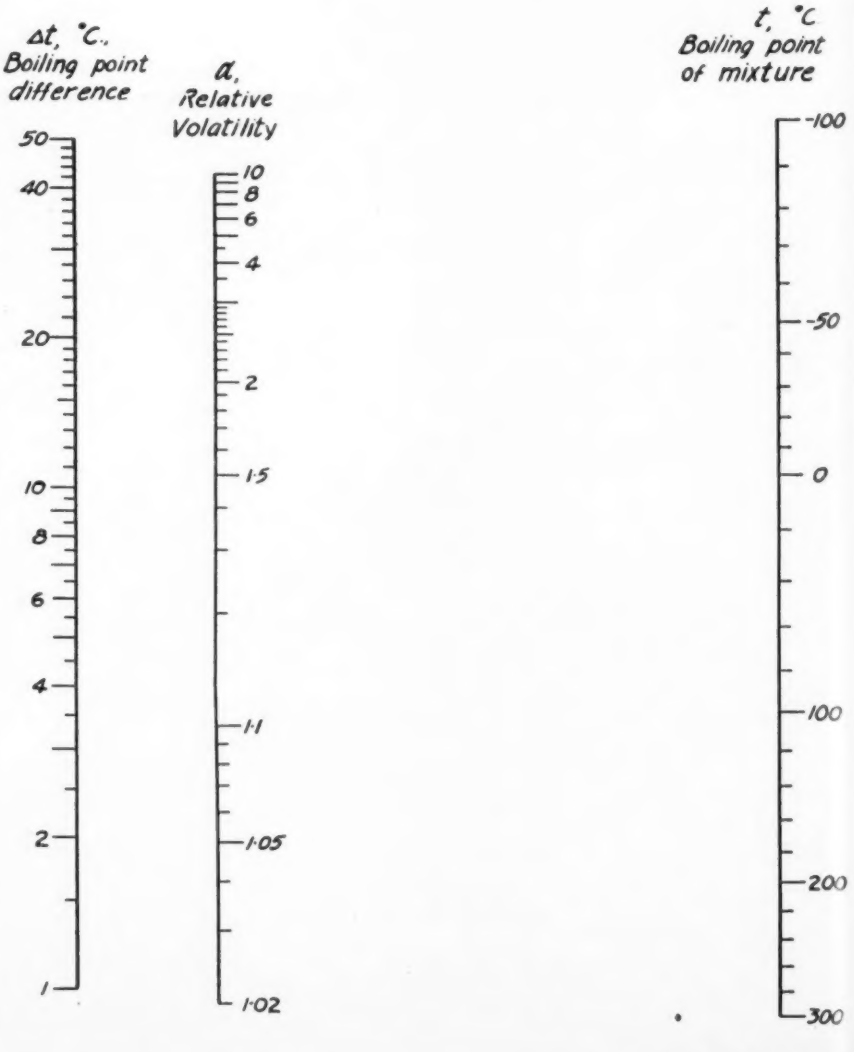
Chemical Industries will be happy to receive any charts that you may have developed so that they may be shared with your fellow engineers. The authors of each chart used will receive an honorarium of $10.

THE successful solution of many problems in fractional distillation depends upon an accurate estimate of the relative volatility of the components in question. The relative volatility α of a binary mixture is ordinarily calculated as the ratio of the vapor pressures of the components. When reliable vapor pressure data are lacking, α may be determined from the equation[2]

$$\log \alpha = \Delta t(3.99/T + 0.00194)$$

which requires only a knowledge of T, the boiling point of the mixture, in degrees Kelvin, and of the boiling points of the components, at atmospheric pressure, so that their difference Δt, in degrees centigrade, may be found.

The equation can be solved conveniently and accurately by means of the accompanying nomograph, which was constructed by methods previously described.[1] The use of the chart is illustrated as follows: What is the relative volatility of benzene and toluene in a mixture of these components that boils at 100° C.? The boiling points of benzene and toluene are 80.1° and 110.6° C., respectively. Connect the difference in boiling points, 30.5°, on the Δt axis with 100° on the t-scale and read the relative volatility on the α scale as 2.43. The relative volatility as calculated from the ratio of the vapor pressures at 100° C., 1344/557, is 2.41.



Literature Cited

(1) Davis, D. S., "Empirical Equations and Nomography", Chap. V, New York, McGraw-Hill Book Co., 1943.
(2) Meipolder, F. W. and Headington, C. E., Ind. Eng. Chem., *39*, 763 (1947).

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PATENT NO.

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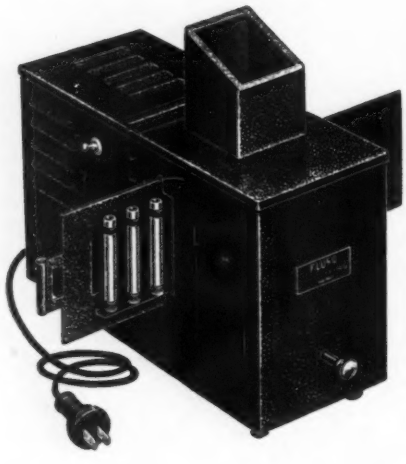

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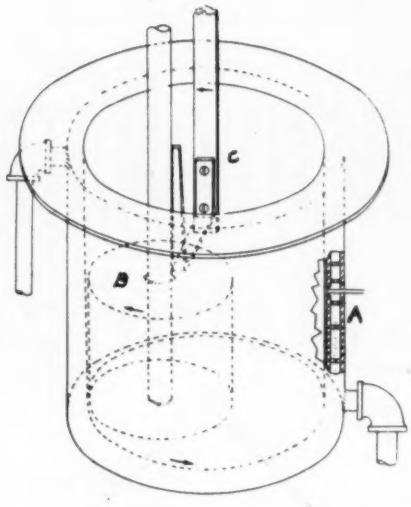
LABORATORY NOTEBOOK

Grease Kettle

A small oil-heated kettle for the easy preparation of many types of lubricating greases in small quantities for laboratory study has been developed by engineers of The Texas Co., 135 E. 42nd St., New York. By maintaining close temperature control it provides a high degree of accuracy in reproducing products. By elimination of a draw-off valve, all possibility of



loss of ingredients or contamination of the grease by remnants of previous batches is avoided.

The new four-liter kettle is stirred by a pestle (B) which moves with a planetary motion, reaching all parts of the interior; it is heated by an oil jacket (A) and insulated with magnesia to insure precise temperature control. To avoid "dead spots" on the kettle wall above the pestle and on the pestle itself, a scraper (C) runs in contact with the wall one-fourth of a revolution behind the pestle. A cross arm of the scraper sweeps both the pestle top and the lower part of the pestle shaft.

The new kettle is a flat-bottomed cylinder 8" in height and diameter, lined with 14 gage stainless steel inside of an oil jacket, and insulated throughout with magnesia. The pestle, a stainless steel cylinder 5 1/16" in diameter and 4" high, is mounted on a 1" shaft. It moves around the kettle at 18¼ rpm. and rotates on its shaft at 60 rpm. resulting in a shearing motion at the kettle wall of 8" per second. It clears walls and bottom by 1/16".

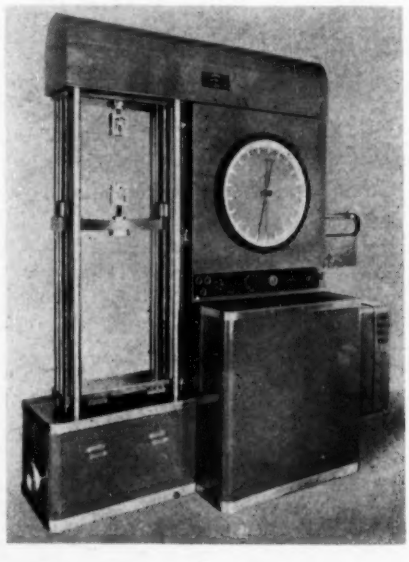
Heating is accomplished by pumping pre-heated oil through the jacketing on the kettle bottom and sides, and temperature is measured by a thermocouple which passes through the jacket to the outer surface of the stainless steel liner. The kettle may be tilted to remove finished products. During this operation the pestle and scraper unit are removed, and swing joints on the connections prevent damage to the pipe system.

Testing Machine

A new machine has been designed for precision testing of plastics, rubber, nonferrous metals, textiles, fibers and similar materials by the A. H. Emery Co., Stamford, Conn. Distinguishing features of the instrument are its continuously-variable 400:1 positive speed range; great horizontal rigidity; complete elimination of backlash; and its high accuracy even in the lowest ranges. Its maximum capacity is 5,000 pounds.

This machine uses a mechanical screw system. The loading crosshead is driven by two screws which pass through nuts in the crosshead. These screws are rotated by a 1 to 1, or 10 to 1 gear transmission which is driven by a variable-speed motor with General Electric Thymotrol control. Speed of loading is steplessly variable from 0.05 inch to 20 inches per minute, and can be held constant within plus or minus 2%.

In the weighing system the capsule is replaced by a 100:1 mechanical compound lever using flex plates instead of the conventional knife edges at the load points and fulcrums. The specimen is pulled, compressed or flexed at the short lever end. The long end operates the force



balance mechanism of the indicating system. Four ranges are provided: 5,000 pounds in 5-pound units; 0-1,000 pounds in 1-pound units; 0-200 pounds in units of 0.2 pound; and 0-50 pounds in units of 0.05 pound.

Range change is by the conventional

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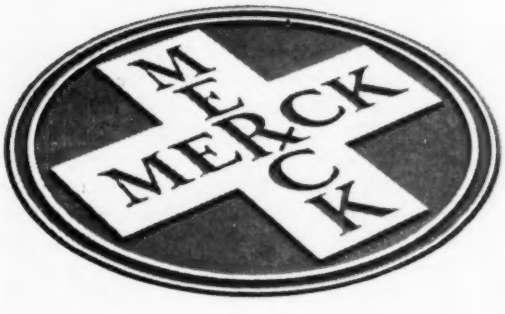

Now entirely free from Government control, these Quinine salts are available for the manufacture of proprietary products, cold tablets, chill tonics, industrial and other products, as well as for antimalarial therapy.

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The machine is designed to permit the use of standard accessories such as grips, extensometers, compressometers, deflectometers, subpresses and flexure tools, as well as special grips required for various materials.

X-Ray Analysis

A new method of analyzing materials by their absorption of X-rays has come from a wartime-developed test for fuses for hand grenades. The technique has shown possible usefulness in examining samples of coal, plastics and tetraethyl lead in gasoline.

First, X-ray absorption is an atomic property. An oxygen atom, for example, will show the same X-ray absorption in the element as in any oxygen compound. Second, under the simplest conditions the absorption is independent of the physical state. This means that the amount of energy taken from an X-ray beam passing through a given mass of material is always the same, be the material hot or cold—gaseous, liquid or solid.

In the experimental analytical apparatus the X-ray tube is aimed upward. Above it is the cell in which the sample is placed and above this is the X-ray detector. This consists of a phototube of the multiplier type, having a number of stages of amplification built in the tube, surrounded by the fluorescent mateiral which glows with a blue-violet light when X-rays strike. The tube changes this light into an electric current which is read on a suitable meter.

When a substance is placed in the cell, the energy it removes from the beam lowers the current read on the meter, and this is taken to measure X-ray absorption by the material. For some substances a very small difference in thickness produces considerable change in absorption, while for other the change is much less. These data can be plotted to give information about the composition of the sample.

The main source of uncertainty is fluctuation of voltage supply. The experimental equipment has a carefully regulated source of power, but this can be eliminated by a comparison method, whereby the sample absorption is alternately compared with that of a standard such as aluminum. Fluctuations in voltage and corresponding X-ray output are affected to virtually the same extent and the errors introduced are minimized. The new General Electric X-ray Photometer accomplishes these results by carrying out such a comparison automatically. This technique is being used at the General Electric Research Laboratory, Schenectady, N. Y.

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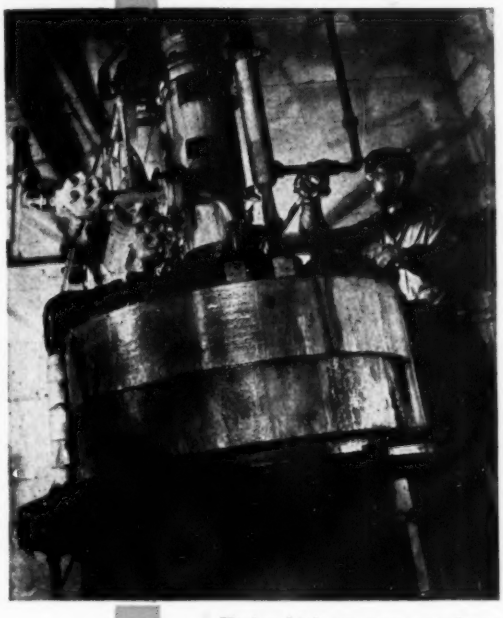

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PHYSICAL DATA

Cyclohexanol
$C_6H_{11}OH$

Mol. Wt.	100.1
Sp. Gr., 25°/15.5°C	0.945
R. I., n20/D	1.4654
Flash Point	68°C
F. R. High Grade	18° to 22°C
Tech Grade	0° to 5°C
B. R. High Grade (100%)	159° to 163°C
Tech Grade (95%)	155° to 165°C

Methyl Cyclohexanol
$CH_3CH_{10}OH$

Mol. Wt.	114.1
Sp. Gr., 15.5°/15.5°	0.924
R. I., n20/D	1.461
Flash and Fire Points	71°C
F. R.	about 20°C
B. R. (100%)	155° to 180°C

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INDUSTRY'S BOOKSHELF

Terpenes

THE TERPENES—Vol. I, by *J. L. Simonsen.* Cambridge, at the University Press; New York, The Macmillan Company, 1947; 479 pp. price $6.50. Reviewed by Frank J. Ball, Development Department, West Virginia Pulp & Paper Co.

"THE TERPENES" since its publication in 1931 has been the definitive volume in terpene chemistry, thus the present revision by the author and Dr. L. N. Owen represents a significant further contribution to this field.

In this edition neither the plan nor the scope of the book have been altered, but the literature through the end of 1945 has been incorporated. Two-thirds of the book is appropriately devoted to the monocyclic terpenes and their alcohol, aldehyde, ketone, and oxide derivatives; while the remainder deals with the simple alicyclic terpenes and their derivatives. The additions and changes in terpene chemistry since 1931 are clearly presented throughout the book and supported by more than four hundred new references.

The author sticks to the pure, largely constitutional chemistry of the terpenes with virtually no mention of commercial uses. His clear, logical style and extensive use of structural formulas results in a very readable book for either student or chemist in this field.

By the use of thinner paper the volume size has been cut by one-third despite sixty added pages.

Science for The Layman

THE PATH OF SCIENCE, by *C. E. Kenneth Mees, D.Sc., F. R. S., Vice President, Eastman Kodak Co.,* with the cooperation of *John R. Baker, M.A., D.Phil., D.Sc. Lecturer in Zoology, University of Oxford, England,* pp. 250; $3.00. John Wiley & Sons, New York, 1946. Reviewed by A. J. Carlson, University of Chicago.

THIS IS an overall reliable and informative book for educated laymen who have little or no experience in science. In the first two chapters the author presents a brief history of science through recorded history. Chapters three to seven deals with the scientific method, and the growth of scientific ideas in physics, chemistry, and biology. Chapters eight to ten present the organization for scientific research, pure and applied, the relation of science to social welfare, and the application of the scientific method to social studies, politics, and government. In the third chapter the author tries to make a fundamental distinction between the motives and the approach of scientists and technologists. "Scientific knowledge arises from certain characteristics in the minds of man which cause him to seek to understand phenomena. Technology arises from an entirely different motive—the desire to acquire more and better things (p. 42) . . . The greatest inventor of all time, Thomas A. Edison, was not a scientist and was not even interested in science (p. 43)." But the author does not make this distinction consistently, for he admits that "technology proceeds by trial and error, the experimental method," that is, the method of science. When we look around, do we not find *some technology necessary and present in all advances in the natural sciences?*

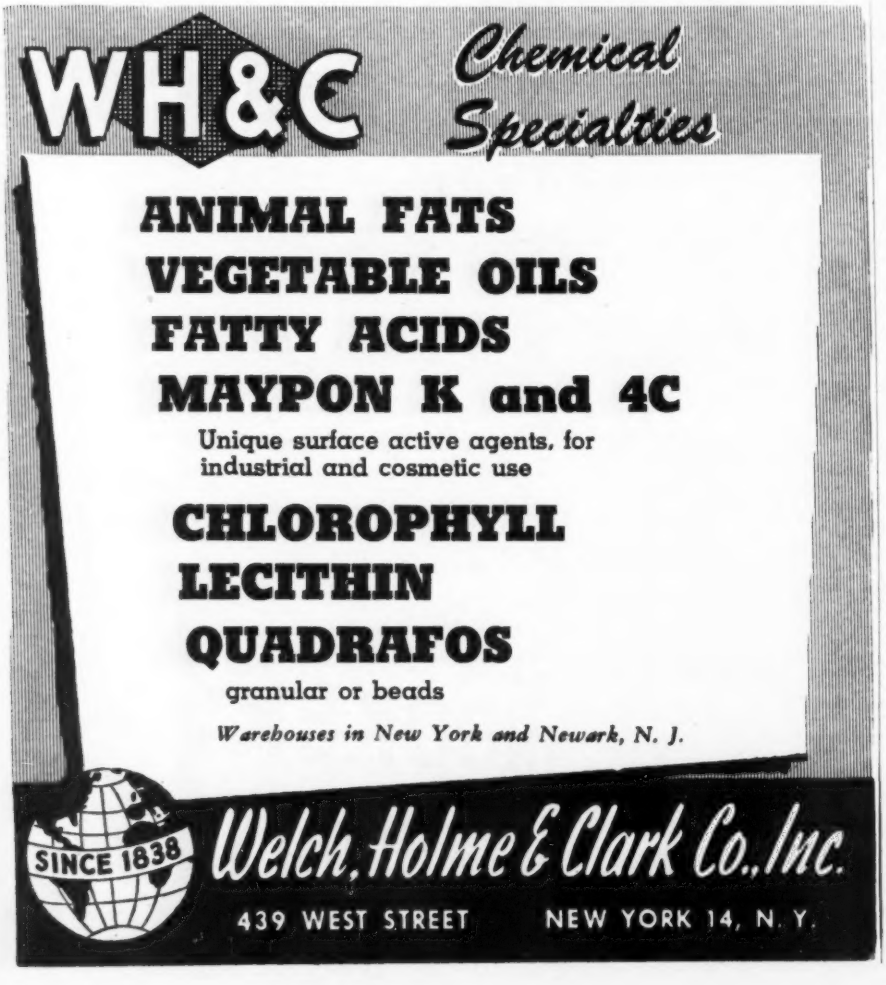
Despite the advances of science and the impact of modern science on society, man, even in our so-called civilized lands, is by and large scientifically illiterate. We cannot understand either man or his environment without fundamental orientation in the natural sciences, an orientation as essential as the mastery of "the three R's." The author thinks he "already sees signs of a new field for the application of the method of science, the field of sociology, economics, and politics (p. 226)," Let us hope that these "signs" are not a mirage, that is, merely wishful thinking.

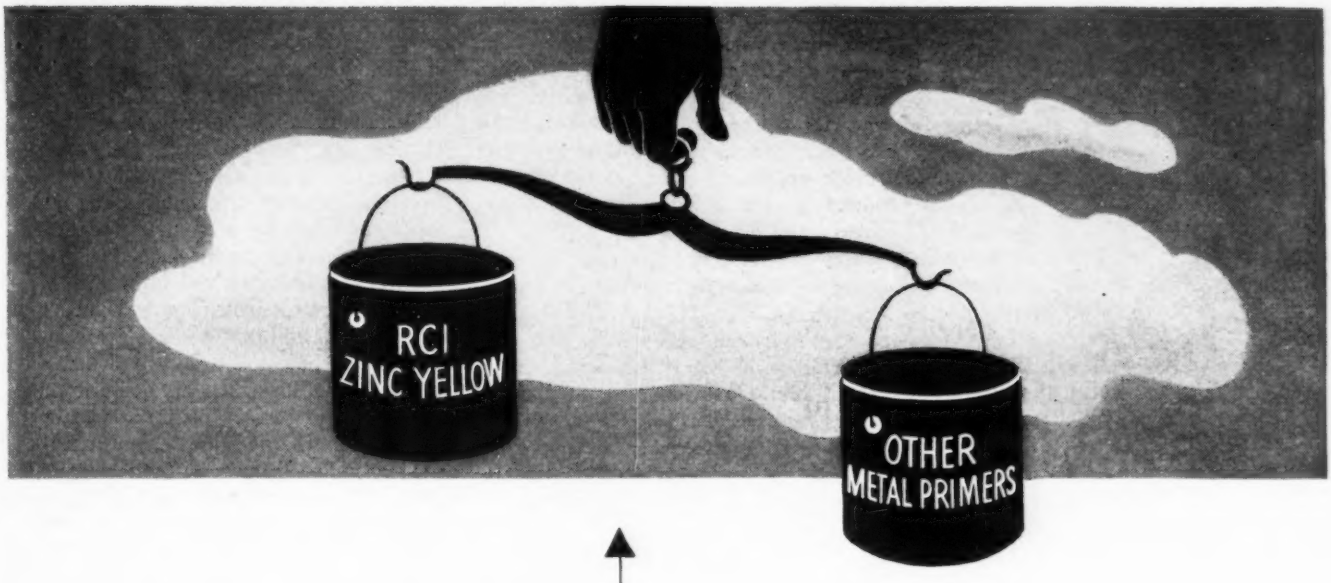
Synthetic Rubber

BUNA RUBBER: THE BIRTH OF AN INDUSTRY, by *Frank A. Howard.* D. Van Nostrand Co., New York, 1947. 307 pp.; price $3.75. Reviewed by A. E. Boss, Pittsburgh Plate Glass Co., Columbia Chemical Division.

THE AUTHOR, Frank A. Howard, is exceptionally well qualified to tell this story. From 1919 to 1945, he was the principal executive officer of the Standard Oil Co. (N. J.) interests engaged in organizing and directing research and development work in the oil refining and related chemical activities of the company. He negotiated the agreements with I. G. Farbenindustrie and other foreign firms which formed part of the basis on which the American synthetic rubber industry was later built. With this background, he has written an absorbing and coherent story of the early developments in synthetic rubber.

The early negotiations with I. G., the formation of Jasco and the discussions with the American government agencies and the principal American rubber com-





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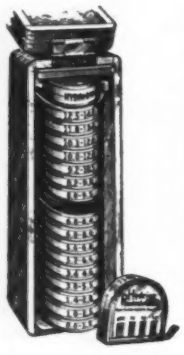

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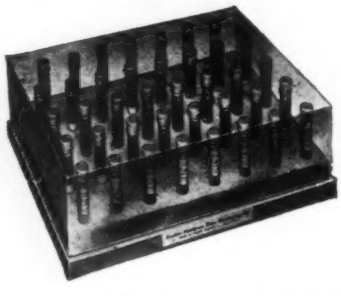

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panies are related in considerable detail and well documented by quotation in the text, or reproduction in the Appendix, of contracts, reports to the Standard management, statements to government agencies and committees. Included in the Appendix are the statements on synthetic rubber by Goodyear and Goodrich submitted to the original Truman Committee.

The contributions of the Standard group of companies are well described. Less stress is laid on the contributions of the American rubber and chemical companies who also had some background in the subject, or on the noteworthy achievements of the popolymer plant operating companies in cooperation with the rubber consuming industry in so modifying the process as to change the product from the somewhat intractable Buna S to the American synthetic rubber GRS which can readily be handled in regular rubber industry equipment, a development of great economic importance.

The book has twenty chapters, an introduction by Robert A. Millikan, and a comprehensive index. It is well printed on good paper and shows every evidence of excellent proof-reading.

Gum Technology

THE WATER-SOLUBLE GUMS, by *C. L. Mantell.* Reinhold Publishing Corp., N. Y., 1947; 278 pp. Price $6.00. Reviewed by Jerome Alexander, consulting chemist.

THE AUTHOR found "confusion in gum designation and technology," and also that "practice and art are ahead of science in the gum field," and he states: "This volume is an attempt to coordinate information relating to water-dispersible products derived largely from a wide variety of plants and known as gums." The scope of the book may be gathered from this abstract of its chapters: (1) Classification and chemistry of gums; (2) Acacia tree gum (arabic) and its varieties; (3) India gums (ghatti, karaya, etc.); (4) Astragalus tree gums (tragacanths); (5) Miscellaneous gums; (6) Hydrophyllic colloids from seaweeds; (7) Hemicelluloses (locust bean gum, seed extracts, Iceland moss); (8) Modified celluloses (methylcellulose, carboxymethylcellulose); (9) Modified starches (including dextrines, etc.); (10) Water-dispersible proteins (gelatin, glues, casein, etc.); (11) Gums in cosmetics and pharmacy; (12) Gums in paints and coating compositions; (13) Gums in textile operations; (14) Miscellaneous applications; (15) Specifications, identification, and testing; (16) Native designations of the gums. Besides the usual author and subject indexes, there is also a botanical index of scientific names of plants.

The book is useful because much of the information it gathers together is widely scattered through the literature; and it is well documented, so that the reader can go to original sources for further information. Format, printing, paper and binding, are excellent.

However, some statements abstracted from the literature are confused and unhappily worded (e. g., on surface tension, p. 10). The discussion of modified starches is inadequate, and is not helped by the antiquated Table from F. Ullman's Enzyklopädie of 1916. Following an unwise suggestion made by a dextrine maker in 1928, dextrines are "described" by the highly specific "Specifications for Cassava Dextrine for the Bureau of Engraving and Printing" (Washington, 1944). These leave much to the judgment of employees and bureaucrats. The statement that *inedible* gelatin (p. 183) is used to make "capsules for pharmaceutical use," is obviously an error.

Hydrocarbons

ENCYCLOPEDIA OF HYDROCARBON COMPOUNDS—Vol. II: C_6 and C_7, by *Joseph E. Faraday.* Chemical Publishing Co., Brooklyn, N. Y., 1947; 603 pp., price $17.50. Reviewed by Howard C. E. Johnson, Chemical Editor, Chemical Industries.

THE CHEMICAL literature is so extensive that any guide to it fills a pressing need. The present volume, like its predecessor, provides copious references to the literature dealing with hydrocarbons.

There are 38 pages, to take an example, on benzene. In these pages are 9 references to natural occurrence of benzene, 541 references to its preparation, and several on constitution and properties.

It is probably inevitable that, in an editing job of this magnitude, some errors should have crept in. Synonyms for 2,3-dimethyl-butane, for example, are given variously in the three pages devoted to that compound as $\beta\gamma$-methylbutane, $\beta\gamma$-dimethylbutane, tetramethylmethane and tetramethyl-methyl-methane.

Like the first volume, this book is a loose-leaf binder, and replacement-addition issues will be published from time to time to keep the work up to date.

Other Publications

THE GUARANTEE OF ANNUAL WAGES by A. D. H. Kaplan, a study of the proposals for the guarantee of substantially full-time pay rolls as overhead. The problems which would arise from such a guarantee, including the effect on total employment, on competitive practices, and on business fluctuation, are considered. The Brookings Institution, Washington 6, D. C. $3.50.

SYMPOSIUM ON PH MEASUREMENT, a collection of seven technical papers intended to present the latest theory and practice on colorimetric and potentiometric methods for making pH and related measurements. Brief discussions of each of the papers are included. American Society

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COMPLETE LIST OF SPECIAL TECHNICAL REPORTS "PB" SERIES, available from the Hobart Publishing Co., Box 4127, Chevy Chase Br., Washington 15, D. C.

METALLIZING NON-CONDUCTORS by Samuel Wein, a survey of the technical and patent literature on plating non-conductors. Specific chemical, mechanical and physical methods are chronologically reviewed. Metal Finishing, 11 W. 42nd St., New York 18, N. Y. $2.00.

WAX AND FATTY BY-PRODUCTS FROM SUGARCANE by R. T. Balch outlines methods of recovery and improved techniques worked out for Louisiana cane at the Houma Experimental Station. Sugar Research Foundation, 52 Wall St., N. Y. 5, N. Y. No charge.

FAR EAST TRADE DIRECTORY, second printing, a postwar classification of far east exporters, importers, manufacturers, distributors and manufacturers agents. The listings include the Indian Empire. Trade Guide and Directory, Far East, Inc., 2 Stone St., N. Y. 4, N. Y. $7.50.

HARDENABILITY OF ALLOY STEELS comprises data on designing, testing, and ordering steels by hardenability-band specifications. A. L. Boeghold's paper on "Selection of Automotvie Steels on the Basis of Hardenability" is included. SAE Special Publications Dept., 29 West 39th St., N. Y. 18, N. Y. $1.00 to SAE members, $2.00 to others.

COMPOUNDING INGREDIENTS FOR RUBBER, second edition, compiled by the editors of India Rubber World contains information on approximately 2,000 ingredients. These are grouped according to their use. India Rubber World, 386 Fourth Ave., N. Y. 16, N. Y. $5.00 in U. S., $6.00 elsewhere.

CHEMICAL STATISTICS DIRECTORY No. 1, an index of government statistics of the chemical industry for 1945. Products are listed alphabetically. Superintendent of Documents, G. P. O., Washington 25, D. C. $.15.

PRINCIPLES OF CHEMISTRY, fifth edition, by Joel H. Hildebrand, a general textbook for beginners. The MacMillan Co., 60 Fifth Ave., N. Y. 11, N. Y. $4.25.

YEARBOOK & OFFICIAL REGISTER OF MEMBERS OF THE AMERICAN-HELLENIC CHAMBER OF COMMERCE, ATHENS-GREECE, 1947, with classified lists of products and commodities arranged in alphabetical order. American Hellenic Chamber of Commerce, 8 America St., Athens. $3.00.

SOILLESS GROWTH OF PLANTS, second edition, by Carleton Ellis and M. W. Swaney, revised by Tom Eastwood, discusses general types of soilless growing, water, sand and gravel culture. Growing techniques are defined and explained. Reinhold Publishing Corp., 330 W. 42nd St., N. Y., N. Y. $4.75.

Government Publications

OFFICE OF TECHNICAL SERVICES

The following reports are available from the Office of Technical Service, Dept. of Commerce, Washington 25, D. C.

PLASTIC AND WOOD FOR AIRCRAFT TOOLING AND FABRICATION; PB-36853, 38 pgs., photostat, $3.00, microfilm, $1.00.
DISPERSING AGENT SS, I. G. FARBENINDUSTRIE HOESCHST; PB-57500, mimeographed, $.25.
THE ARSENICAL PHARMACEUTICALS OF THE FARBENWERKE, HOESCHT; PB-62869, 28 pgs., photostat, $2.00, microfilm, $1.00.
LITHIUM EXTRACTION AND USES; PB-1305, 32 pgs., mimeographed, $.50.
RARE AND MINOR METALS; PB-28908, 19 pgs., mimeographed, $.50.
THE LITHIUM ELECTROLYTIC CELL DOGUSSA, RHEINFELDEN; PB-25724, 11 pgs., photostat, $1.00, microfilm, $1.00.
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REPORT OF LITHIUM RESEARCH; PB-22472, 22 pgs., photostat, $2.00, microfilm, $.50.
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VOLUMETRIC DETERMINATION OF WATER IN PAINTS AND VARNISHES; PB-52027, 7 pgs., photostat, $1.00, microfilm, $1.00.
A SURVEY OF THE USE OF INFRA-RED SPECTRA IN CHEMICAL ANALYSIS IN GERMANY; PB-48678, 215 pgs., photostat, $15.00, microfilm, $5.00.
GERMAN PAPERMAKING INDUSTRY; PB-75876, 173 pgs., photostat, $12.00, microfilm, $4.00.
THE MANUFACTURE OF ANTIFOULING PAINTS IN GERMANY AND RELATED MATTERS; PB-75882, 107 pgs., photostat $7.00, microfilm, $3.00.
FURTHER DEVELOPMENT OF MALARIA THERAPY. SONTOCHIN, A NEW SYNTHETIC MALARIA THERAPEUTIC; PB-28951-T, 6 pgs., mimeograph, $0.10.
BIBLIOGRAPHY OF SCIENTIFIC AND INDUSTRIAL REPORTS; published weekly, $10.00 per year.

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"Alkalies and Chlorine in the Teratment of Municipal and Industrial Water". 94 pgs., Bul. No. 8, Solvay Sales Corp.

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"Photochlorinations". 7 pgs., Hanovia Chemical and Manufacturing Co.

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Bibliography on bovine plasma albumin. Biochemical Sales Research, Chemical Research and Development Dept., Armour Laboratories.

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"Sharples Synthetic Organic Chemicals". 14th ed., 72 pgs., Sharples Chemicals Inc.

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"Lunkenheimer Bottle Oilers". 4 pgs., Circular 560-RL, The Lunkenheimer Co.

Elevating Tables G538
"Lyon-Raymond Portable Hydraulic Elevating Tables". 8 pgs., Bul. 231, Lyon-Raymond Corp.

Pumps G539
"Goulds 'Close-Cupld' Centrifugal Pumps". 12 pgs., Bul. 710-1, Goulds Pumps, Inc.

Turbidity Recorder G540
"Turbidity Recorder TR-6". 2 pgs., Bul. 604, Ess Instrument Co.

Pumps G541
"Rotary Hand Pumps". 3 pgs., Bul. No. 3001, Bowser, Inc.

Temperature Controller G542
"Temperature Controller and Indicator". 1 pg., Series 500, Thermo Electric Mfg. Co.

Rotary Sifters G543
"Bar-Nun Sifters". 11 pgs., Catalog No. 101, Section "S", B. F. Gump Co.

Steam Traps and Separators G544
"Steam Specialties for Power Plants, Heating and Processing Equipment". 4 pgs., Bul. No. CI 47, Wright-Austin Co.

Rotameter G545
"A New Era in Liquid & Gas Flow Measurement". 32 pgs., Catalog section 10-D, Fischer & Porter Co.

Test Bar Designs G546
"A Comparison of Test Bar Designs Cast in 85-5-5-5 Alloys", by L. W. Eastwood and J. G. Kura. 9 pgs., Non-Ferrous Ingot Metal Institute.

Demineralizers G547
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	LIQUID POLYETHYLENE GLYCOLS			
	200	300	400	600
Average Molecular Weight	190 to 210	285 to 315	380 to 420	570 to 630
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Saybolt Viscosity at 210°F., sec.	38 to 41	42 to 46	45 to 55	60 to 70
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"Astell Light Wall Stainless Weldings Fittings". 4 pgs., John B. Astell & Co., Inc.

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"A Newer and Finer Optical Projection Comparator". 6 pgs., Engineers Specialties Div., Universal Engraving & Colorplate Co., Inc.

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"Cochrane Steam Purifiers". 12 pgs., Publication 2725, Cochrane Corp.

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"Kerotest Stainless Alloy Valves". 4 pgs., Catalog 47-AS, Kerotest Mfg. Co.

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"Blueprint for Industry, Part IV, Continuous Extrusion Takeup Equipment". 12 pgs., Industrial Ovens, Inc.

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"Air Operated Controllers for Temperature, Pressure, Flow, Liquid Level, Humidity". 40 pgs., Catalog No. 8905, The Brown Instrument Co.

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"Heat Losses in Furnace Linings" by J. D. McCullough. 11 pgs., Bul. 3-404, Refractories Div., The Babcock & Wilcox Co.

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"Selected Indexes and Sources of Photographic Visual Aids". 11 pgs., Eastman Kodak Co.

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"Corrosion Resisting Process Equipment". 7 pgs., General Catalog J, The Durion Co., Inc.

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"Gow-Mac Ever-Tite Thermal Conductivity Units for any Normal Gas Flow Requirement". 4 pgs., Gow-Mac Instrument Co.

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Bearings G578
Anti-friction developments in carbide cutting tool field. 60 pgs., SKF Industries, Inc.

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Heaters and Thawers G580
"Hauck Heaters and Thawers". 16 pgs., Bul. No. 1047, Hauck Mfg. Co.

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COMPOSITION (Crystal Modification)

Monoclinic, tetragonal, cubic, trigonal

PHYSICAL AND THERMAL PROPERTIES

Melting point	2675° ± 20°
Molecular volume	21.50
Heat of formation	264K cals/mol
Specific Gravity	5.5-6.0
Index of refraction	2.13-2.21+
Moh's hardness	6.5
Mean specific heat (20°-1000°C)	0.16
Thermal conductivity . app. 0.0089 cal/cm²/cm/°C/sec.	
Thermal expansion (mean reversible 20°-1000°)	6.6x10-⁶/°C
Coeff. of expansion (fused zirconia)	0.00000084
Compressive strength . . . . 20°C	298,680 psi
500°C	237,570 psi
1000°C	170,680 psi
1500°C	2,840 psi

ELECTRICAL PROPERTIES

Resistivity ohm-cm at . . . . 340°C	2.1×10^6
700°C	2.3×10^4
1200°C	1.2×10^3 ohm/cm³
Dielectric Constant	20.

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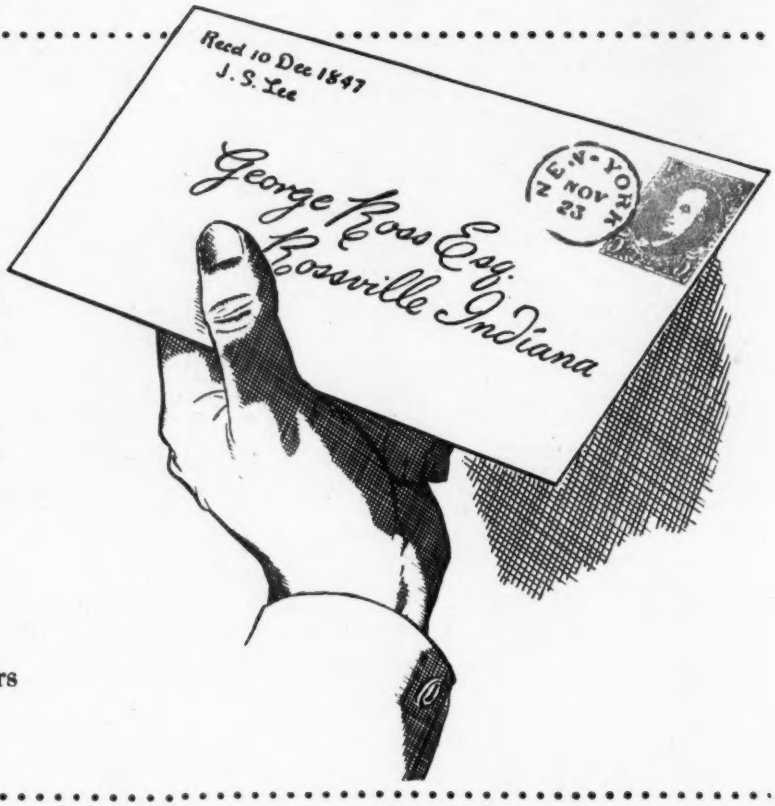

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Starting in 1847 with 50 thousand dollars in stamps, the United States Post Office Department today handles billions of dollars in postage, money orders and postal savings every year.

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NEWS OF THE MONTH

USDA Pushes Research Program

Among recent research projects planned by the Department of Agriculture, and authorized under the Research and Marketing Act of 1946, are the following:

1. Studies of the fundamental characteristics of cotton fiber.
2. Utilization of barks, woods, sumac leaves and other plant waste materials in the production of tannins.
3. Methods of modifying the characteristics of domestic wools so that they may better meet competition from imported wools and synthetic fibers.
4. Maintaining sugar content and quality of harvested sugar beets.
5. Enhancing the flavor of soybean oil.
6. Pilot plant studies of derivatives of gum naval stores.

Wight on Freeport Board

Charles A. Wight, elected a member of the board of directors, Freeport Sulphur Co. He is a vice-president of Bankers Trust Co. and a director of Grumman Aircraft Engineering Corp.

Chemical Corporations' Sales Advance

Chemical manufacturing companies during the war years had net sales increases ranging from an index of 118 to 149, for 1942 to 1945 respectively, taking sales for 1941 at 100, the Federal Trade Commission reports.

Chemical companies having assets of $250,000 to $1,000,000, had net sales of 139 in 1945, ten points lower in 1944, 112 in 1942, using 1941 sales as 100; companies in the next larger assets bracket, 1-5 million dollars, had sales of 163 in 1945, one point higher in 1944, and 120 in 1942, on the same basis; sales by companies with assets of $10,000,000 and up had an index of 148 in 1945; 145 the previous year, and 118 in 1942.

The intermediate group, $5 to $10 million assets, had sales indexes of 117 to 139 for 1942 to 1945 respectively.

Compile Hydrocarbon Data

A clearinghouse of information on the properties of hydrocarbons, known as the American Petroleum Institute Research Project 44, which was set up to determine the physical and thermodynamic properties of all hydrocarbons, is now publishing in book form the results of five years research. This publication will be unique in that it will contain the collected data of industrial, academic, and government laboratories.

The advisory committee of the new project consists of chairman W. E. Kuhn of The Texas Co., Otto Beeck of the Shell Development Co., Gustav Egloff of Universal Oil Products Co., and S. S. Kurtz, Jr., of the Sun Oil Co. Direction of the work was placed under Frederick D. Rossini, chief of the Section on Thermochemistry and Hydrocarbons at the National Bureau of Standards, with Kenneth S. Pitzer, University of California, as associate director of the project.

The bound volume will contain about 500 pages and will be issued as National Bureau of Standards Circular 461 entitled "Selected Values of Properties of Hydrocarbons."

Release Farben Nylon Patents

Some 46 patents and a number of patent applications relating to the manufacture of nylon are now available for licensing by the Office of Alien Property, Department of Justice.

The patents, formerly owned by I. G. Farben, can be licensed to Americans on a royalty-free, non-exclusive basis for an administrative fee of $15 per patent or application.

A list of the 46 patents and applications, together with licensing information, can be obtained without cost from the Office of Alien Property, Department of Justice, Washington 25, D. C.

U. S. Offered German Plants

Additional German chemical plants have been offered to American industrial purchasers as reparations, by the American military authorities.

The latest include parts of the Dynamit A. G. Geestacht-Krummel, and equipment from Lippoldsberg, Germany Paraxol plant. The two will be sold independently of each other. Both plants are reported to be in good condition, and of special interest to American manufacturers of synthetic resins used in lacquers and coatings.

Details are obtainable from the Office of Foreign Liquidation, General Disposals Division, Washington, D. C.

Glyco Appoints Roberts

William H. Roberts, new general plant manager for the Natrium plant, Glyco Products Co., Inc. He was previously with E. R. Squibb & Sons.

Exposition to Feature New Chemicals and Equipment

Postwar progress in the chemical and process industries will be a significant feature that will be reflected in the exhibits at the 21st Exposition of Chemical Industries at Grand Central Palace, New York, December 1-6. News from exhibitors indicates a marked trend in the development of materials and units of all types designed to meet extremely difficult operating conditions, notably in the way of very high pressures and temperatures, and powerful corrosive effects.

The exposition will be one of the largest ever held, with an unusual variety of displays including industrial chemicals, chemical products, industrial materials and supplies of many kinds, in addition to the wide range of equipment specifically designed for the process industries. The roster of exhibits already accounts for all available exhibition space on the four floors of the Palace.

Plan First British Streptomycin Project

Indications are that The Distillers Co., which recently acquired the mammoth penicillin plant located at Speke,

England, and formerly owned by the government, will soon begin to produce streptomycin.

The acquisition, which is part of the company's $30 million expansion plant, will make Distillers the largest penicillin producer in England, and one of the largest in the world. According to present plans, major emphasis will be placed on penicillin output, but smaller quantities of streptomycin will also be made.

Search for Domestic Wax Sources

The Bureau of Mines is searching in the lignite fields of the Dakotas, Montana, California and Arkansas for a domestic source for the fine waxes formerly imported from the Russian-occupied zone of Germany.

Small deposits have been found in California and Arkansas and a recovery plant built in the latter State, but the bureau says that thus far the vast lignite fields of the Dakotas and eastern Montana have been unproductive of waxes.

Restrict Export of Radiation Equipment

The U. S. Atomic Energy Commission is establishing rules governing export of equipment for production of fissionable materials, as required by law.

The regulations will attempt more effective control over export of specific classes of declassified equipment such as radiation detection apparatus, mass spectrometers, high vacuum equipment and particle accelerators. Other items may be added to the list from time to time.

The Commission has hitherto used existing export control agencies, coupled with cooperative participation by manufacturers.

Carlat Forms New Company

S. S. Carlat has organized Sterol Derivatives, Inc. for research, development and production of chemicals used in pharmaceutical manufacturing. He was formerly a partner of the Coast Chemical Co.

CALENDAR *of* EVENTS

AMERICAN ASSOCIATION FOR ADVANCEMENT OF SCIENCE, annual meeting, Chicago, Dec. 26-31.

AMERICAN PHARMACEUTICAL MANUFACTURERS' ASSOCIATION, mid-year meeting Waldorf Astoria, New York, Dec. 8-10.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS, annual meeting, Atlantic City, Dec. 1-5.

ASSOCIATION OF AMERICAN SOAP AND GLYCERINE PRODUCERS, Waldorf Astoria, New York, Jan. 28-29.

CHEMICAL INDUSTRIES EXPOSITION, Grand Central Palace, New York, Dec. 1-6.

COMPRESSED GAS MANUFACTURERS' ASSOCIATION, INC., 35th annual meeting, Waldorf Astoria, New York, Jan. 26-27.

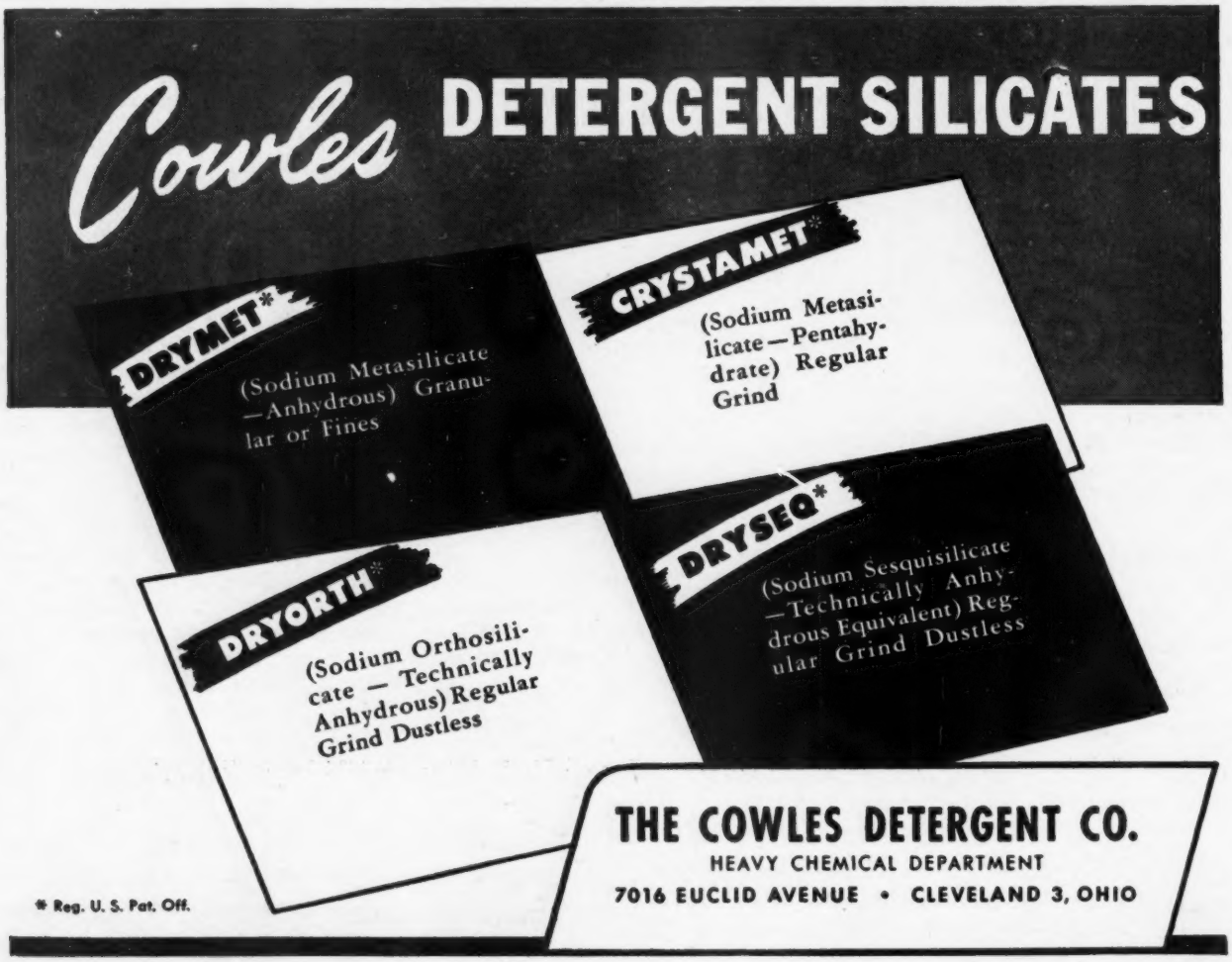
NATIONAL ASSOCIATION OF INSECTICIDE AND DISINFECTANT MANUFACTURERS, INC., 34th annual meeting, Lord Baltimore Hotel, Baltimore, Dec. 1-3.

NATIONAL ASSOCIATION OF MANUFACTURERS, Waldorf Astoria, New York, Dec. 3-5.

Ease Streptomycin Export Restrictions

A record monthly production of 1,041,000 grams of streptomycin in September led the Commerce Department to authorize a record 600,000 grams for export in October.

In view of the distribution and inventory position of the industry, and since September production was approximately 20 per cent above that in August, the October export quota of streptomycin was set at 600,000 grams.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3-Hydroxy-2-naphthoic acid-2,5-dimethoxyanilide
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Chromium silicide
Chromium nitride
Erythritol
o-Dinitrobenzene
Benzyl hyponitrite
Carbon oxyselenide
Carbon sulfoselenide
Sodium-N-p-chlorophenyldiazothiourea
2-Ethyl-1,4-benzoquinone
3-Ethyl-1,2-benzoquinone
4-Methyl-1,2-benzoquinone
Galactoflavin
Lumiflavin
Pyrithiamine
2-Thio-5-keto-4-carbethoxy-1,3-dihydropyrimidine

AEC Initiates Safety Program

The U. S. Atomic Energy Commission has launched an extensive program to promote industrial safety and health, as well as safety and fire prevention, in connection with Commission activities and those of its contractors.

The first step was appointment of a Safety and Industrial Health Advisory Board, which is scheduled to visit the principal atomic energy installations and report on all phases of operations concerning its particular field.

COMPANIES

AMERICAN FIRSTOLINE CORP., New York, has started commercial production of tetrachlorethylene, also known as perchlorethylene, standard grade. Output is scheduled to reach over 1,000,000 pounds monthly.

An Odessa, Texas, channel carbon black plant operated during the war by the United Carbon Co., has been sold for $4,300,000 to SID W. RICHARDSON, Fort Worth, Texas, independent oil and gas operator.

The plant consists of 670 buildings on 426 acres of land. It has a capacity of 45,000,000 pounds of carbon black annually.

Montgomery Heads Martin Engineering

T. F. Montgomery, appointed head of the engineering section, Plastics and Chemicals Div., The Glenn L. Martin Co. He is a graduate of Waynesboro College and Lehigh University.

FERRO ENAMEL CORP., Cleveland, Ohio, has established a manufacturing plant in Nashville.

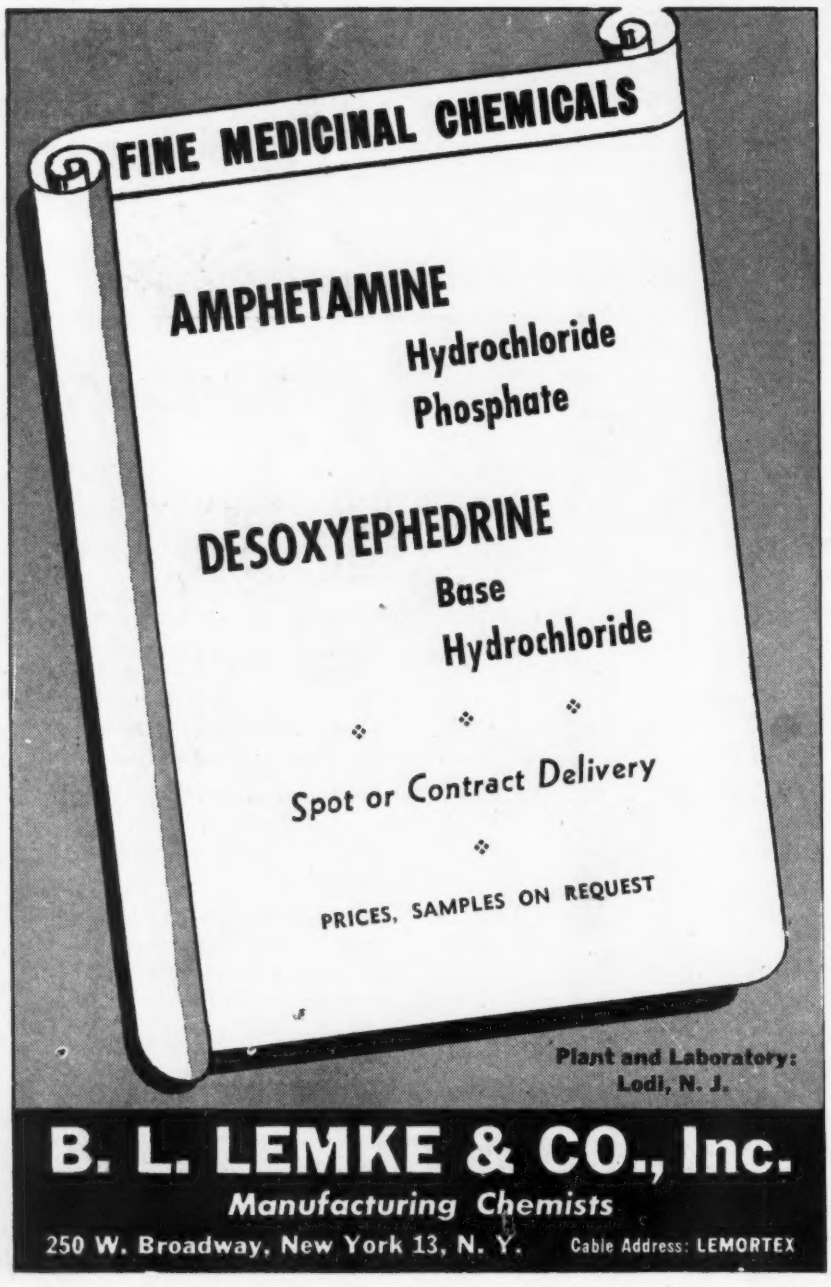
The unit will be sufficient to produce an ample amount of porcelain enamel frit to take care of consumption of stove, refrigerator, signs, bathroom fixture, and furniture manufacturers.

A federal center of applied mathematics —the NATIONAL APPLIED MATHEMATICS LABORATORIES—has been established as a division of the National Bureau of Standards. John H. Curtiss has been named chief of the laboratories.

Organized to conduct research and provide services in the field of applied mathematics, the new organization is oriented around modern mathematical statistics as applied to the physical and engineering sciences and to the development and use of modern high speed computing. The Applied Mathematics Laboratories include four separate laboratories: the Institute of Numerical Analysis; the Computation Laboratory; the Statistical Engineering Laboratory; and the Machine Development Laboratory.

THE FINISHES DIVISION, INTERCHEMICAL CORP. has established a New England sales branch for the company's industrial finishes with offices located at 10 North Main Street, West Hartford, Connecticut. This new branch will operate under the direction of Robert K. Hungerford as New England sales manager.

War-surplus sodium bichromate production facilities built by the government to increase the capacity of the MARTIN DENNIS Co. plant in Kearney, N. J., have been sold to the Martin Dennis Co. for $204,000 cash. The facilities, only partially completed by the government, are intermingled with those owned by the purchaser.



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The DIAMOND ALKALI Co. has leased 22,000 square feet of space on the third floor of the Union Commerce Building for the temporary housing of its administrative headquarters as the first step in its move to Cleveland. Permanent administrative headquarters of the company are to be located in Mayfield Heights, where the company is planning the construction of a 2½ to 3 million dollar administration and research center.

COMMERCIAL SOLVENTS CORP. has opened a new district office in the Baronne Building, New Orleans, La.

John Owen, who has for many years handled the sale of C. S. C. products in the New Orleans area, has been appointed district manager.

ATTAPULGUS CLAY Co. and POROCEL CORP., producers of Fullers Earths and activated bauxites, have moved their executive, sales and general offices from 260 South Broad Street, Philadelphia, to 210 West Washington Square, Philadelphia 5, Penna.

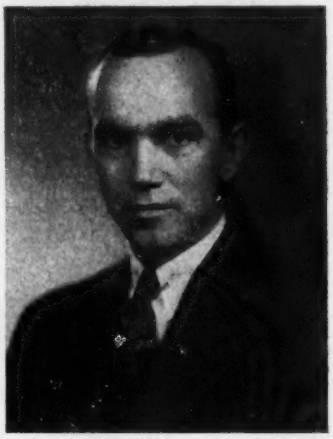
CELANESE CHEMICAL CORP., division of Celanese Corp. of America, has extended its area sales representation to Los Angeles, Detroit and New England.

John Stevens has been assigned to cover the sales of Celanese chemicals in the New England area, C. Harry Snell will be responsible for sales representation on the West Coast and Thomas J. O'Dwyer will work out of Detroit for the Mid West area. The branch offices established by the chemical division will be devoted exclusively to the company's chemical business.

The DU PONT Co.'s new contact sulfuric acid works at James River, Va., has started operations.

Located 14 miles from Richmond, the unit is operated by the Grasselli Chemicals Dept. First shipments have been made.

Cabot Elects Brown



Owen J. Brown, Jr., chosen vice-president, Godfrey L. Cabot, Inc. He was previously general sales manager for the company, and has been with it since 1935.

FALK AND Co., Pittsburgh, Pa., has appointed SHERWOOD AND Co., INC., Kansas City, Missouri, as its Kansas City representative. Sherwood and Co. will handle Falk and Co.'s complete line of oils, resins, and other specialties manufactured for the surface coatings industries.

The board of directors of INTERNATIONAL PAPER Co. has approved a construction program for 1948 and 1949 involving the expenditure of $25,000,000. This program will include increases in kraft board capacity of the company of approximately 900 tons per day and kraft paper capacity of approximately 100 tons per day.

The additional capacity will be obtained not by building new mills, but by changes in existing mills.

ACHESON COLLOIDS CORP., Port Huron, Michigan, producer of colloidal graphite products, has purchased its British counterpart.

Through its wholly owned subsidiary, Acheson Colloids Ltd., London, England, the American company has bought the entire operating assets of E. G. ACHESON LTD., which, in spite of the similarity in name, was a completely independent concern.

The new laboratories of HERSTEIN LABORATORIES, INC., at 128 Water Street, New York 5, New York, are now functioning. Enlarged and improved facilities are available for industrial research and the preparation of rare chemicals for investigation and reagent uses.

HOOKER ELECTROCHEMICAL Co. of Niagara Falls, New York, has appointed THE GIRDLER CORP., of Louisville, Kentucky, as its licensing agent for a Hooker process used to produce HCl from hydrogen and chlorine. This process has resulted from development work by Hooker.

The $95,000 action filed by Stanford L. Hermann, formerly vice-president and director of Apex Chemical Co., Inc., against the corporation and its present officers came before Judge Vincent Leibell, Federal Court, New York, on Oct. 10. The decision was reserved.

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BOSTON Mulcahy & Griffin	CLEVELAND S. S. Skelton	KANSAS CITY John T. Kennedy Sales Co.	NEW ORLEANS C. N. Sutton	PORTLAND, ORE. Miller & Zehrung Chemical Co.	SEATTLE Carl F. Miller & Co.
CHICAGO Philip E. Calo Co.	DETROIT C. W. Hess Co.	LOS ANGELES E. B. Taylor Co.	PHILADELPHIA Loos & Dilworth, Inc.	SAN FRANCISCO E. M. Walls	TORONTO, CANADA A. S. Paterson

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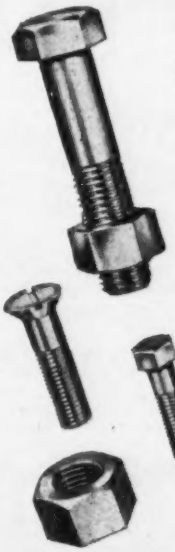

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214 WALTON BUILDING ATLANTA 3, GEORGIA
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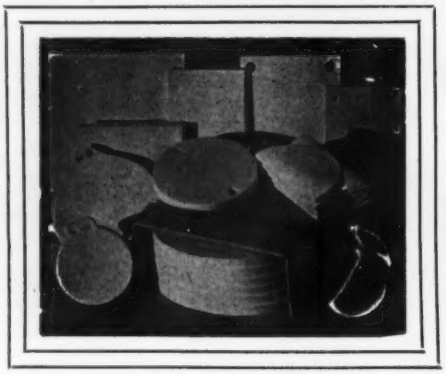

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Everett Joins Marshall-Moorman

Edward F. Everett, Jr., now with the Marshall-Moorman Development Co. where he will assist with process development and design. He was formerly with M. W. Kellogg Co.

CANADA

Serious Shortage of Trained Personnel

Even though starting salaries for both chemists and chemical engineers have doubled in the past few years, Canadian manufacturers are still unable to obtain enough men to fill existing needs. The supply of young, inexperienced men is short, but even worse is the situation as far as graduates who have acquired a dozen years' industrial background. Too, although universities are boasting record enrollments in their science departments, the prospects for any material easing in the supply-demand balance are not too bright.

There are several reasons for the existence of this condition. One is, of course, the fact that many young men who normally would have been graduate scientists by now were called into the Armed Forces. Therefore, their appearance on the industrial scene has been delayed. Another factor, and one which cannot be minimized, is the migration of skilled men to the U. S. A. Within the past year or two this exodus has been at an all-time high, and has caused government officials no little concern.

Highlighting this circumstance is a report filed by the National Research Council. This organization states that even the opportunity to work on the Chalk River atomic energy project has not provided a sufficient incentive to enable the Council to fully staff its laboratories. As a result several important projects are seriously retarded, not only in the Council's main research laboratories but also as far as auxiliary developments are concerned.

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PERSONNEL

Production

EMMETT K. CARVER has been appointed to the newly-created position of technical assistant to the general manager, Eastman Kodak Co. CHARLES R. FORDYCE has been named to succeed him as superintendent of the department of manufacturing experiments at Kodak Park.

Mr. Carver will advise on experimental and development work.

R. L. BAUER and R. E. LENZ have been appointed assistant managers, the Process section of Monsanto Chemical Co.'s General Engineering Department.

Whittington Joins American Potash

Joseph S. Whittington, named manager of sodium sulfate sales, American Potash & Chemical Corp. He was formerly with F. W. Berk & Co., Inc.

RAYMOND H. MCLEOD, formerly of the Dow Chemical Co., recently joined the technical staff of the Electro Rust-Proofing Corp., Belleville, New Jersey. He will work with the engineering group in the company's Chicago office.

ALLAN O'NEAL, with The B. F. Goodrich Company since 1933, has been named manager of the company's plant in Clarksville, Tennessee. He succeeds C. R. SPENCER, resigned. He was transferred to the Clarksville plant as assistant technical manager in 1940 becoming technical manager two years later.

JOSEPH L. NEINER has assumed the position of chief operation executive, Chamblee, Georgia, branch of Boyle-Midway, Inc., household division of American Home Products Corp. He was formerly assistant branch manager for Boyle-Midway in Cincinnati.

Research

STUART O. FIEDLER has accepted a position as manager of research of the Industrial Rayon Corp., Cleveland, Ohio. He is a director of Bjorksten Research Laboratories, but is resigning as manager of the South Chicago Branch of that company.

WILLIAM W. HARTMAN has been appointed superintendent of the synthetic chemistry department, Kodak Research Laboratories.

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Refractive Index 20C	1.483	1.483	1.482	1.481
Unpolymerized Residue	0.4%	0.4%	0.8%	2.5
ASTM Distillation				
5%	215C	210C	206C	197C
95%	220C	220C	220C	222C
Moisture	0.2%	0.4%	0.5%	0.5%

PROPERTIES

Grade	Color	Tertiary Alcohols	Phenol Coefficient†
XH :	"Water White"	73%	6.2
STANDARD :	"Water White"	66%	5.5
AMBER :	"Straw Yellow"	58%	5.0
SPECIAL :	"Water White"	*73%	3.7

* Total Alcohols.

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Representing the most significant development in thermostat design in forty years, the new "Precision" DUAL Hydraulic Thermostat offers a positive, double margin of control safety, which makes long run constant temperature tests a routine procedure. The extra protection afforded, during these "life-time" tests, which may require weeks or even months of continuous cabinet operation, safeguards valuable materials and cultures, and virtually assures the completion of this type of test without interruption and without loss of time.

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Write for Bulletin 345 which gives complete details on this exceptional engineering development.

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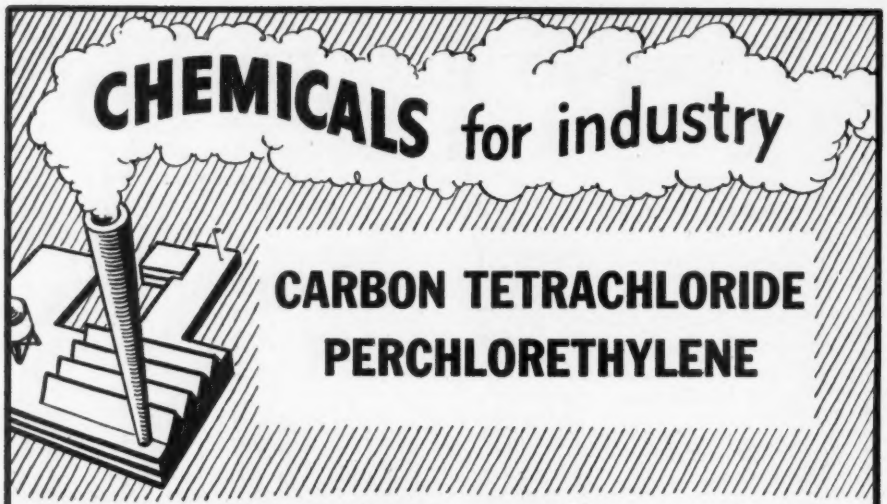

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Sodium Azide
Sodium Cyanate

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Quaker Oats Appoints Webster

William A. Webster has joined the Chemicals Dept., Quaker Oats Co., to take charge of the sales of furfural residue in the United States. His headquarters will be in Chicago.

GORDON M. BUTLER, JR., has been made senior engineer of the Research Division, Carborundum Co. He was formerly chief metallurgist at the Dunkirk, N. Y., plant, Allegheny Ludlum Steel Corp.

HAROLD D. ALLEN and CARL M. MARBERG have been appointed research associates on the staff of Standard Oil Co. (Indiana). They will be located at Standard's new research laboratory at Whiting, Indiana.

Sales

Stein, Hall & Co., Inc., has named WILLIAM N. KLINE, JR., as manager of the company's branch office in Charlotte, North Carolina. He has been associated with the company since June 1929.

Woburn Chemical Corp. (N. J.) has appointed WARD L. ATWOOD, assistant to the president, as sales manager. RICHARD O'ROURKE, vice president, has resigned as sales manager due to illness, but will continue serving the company on special industrial relations projects.

SAMUEL D. KOONCE, formerly of the research division of Distillation Products, Inc., has joined the sales department of Jefferson Chemical Co., Inc., New York, N. Y. He will be engaged in market research and in liaison work between the sales department and the technical and research department.

Atlas Powder Co.'s Industrial Chemicals Department has promoted EDWARD W. SANN, Chicago district manager, to its general headquarters in Wilmington, Delaware. He has been associated with this department since 1936, and was made manager of the Chicago district in 1945.

The Grasselli Chemicals Department, Du Pont Co., has chosen THOMAS J. DESMOND as sales manager for heavy chemicals. He succeeds the late Howard E. Davis.

REID G. FORDYCE has been appointed sales development manager of Monsanto Chemical Co.'s plastics division and EDMUND S. CHILDS has been appointed assistant manager of the sales development department.

GUMS:

GUM ARABIC
GUM ARABIC BLEACHED
GUM GHATTI
GUM KARAYA (Indian)
GUM TRAGACANTH
GUM EGYPTIAN
GUM LOCUST (Carob Flour)
QUINCE SEED

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SPECIALTIES:

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TARTARIC ACID

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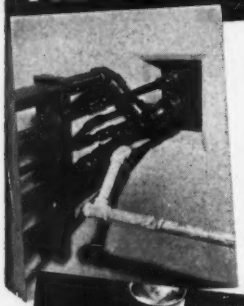
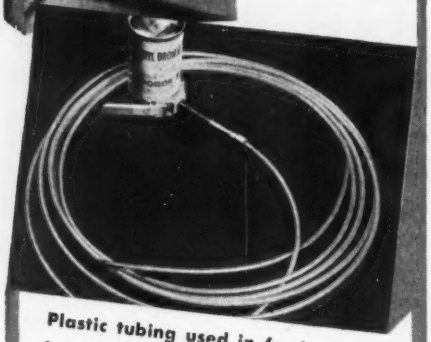


Typical installation of plastic pipe in a chemical plant, with other pipe alongside.



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CHEMICAL SPECIALTIES

A department devoted to news of the chemical specialties field. Descriptions of new specialty products will be found in the New Products & Processes department.

Looks to Industry For Insecticide Evaluation

State and Federal researchers have been snowed under by the development of new crop-protecting chemicals, according to Dr. P. N. Annand, chief of the Bureau of Entomology and Plant Quarantine.

The old ideal of exhaustive tests and complete recommendations-for-use before selling some future successor to DDT is no longer possible, he says, and if no recommendations for public use were made until all the desirable research data were available on all possible applications of the material there would be no recommendations for most materials in the foreseeable future.

Furthermore, industrial laboratories will contribute more as time goes on to the time-consuming preliminary testing of materials and their early evaluation.

Soilax Opens Jersey Plant

Dedication ceremonies were held at Irvington, N. J., recently for the opening of a new plant of Economics Laboratory, Inc., manufacturers of Soilax and other home and industrial cleaning compounds. The new plant, which has a floor area of 40,000 square feet, will manufacture and package Soilax, Super-Soilax, Tetrox, Mikroklene and other cleansers and germicides.

Economics Laboratory has its main offices and research laboratories in St. Paul, manufacturing units in Brooklyn and Chicago. The new plant is expected to increase the output of the company's products by 40 per cent, an expansion made necessary by the rapid growth of the company which now does a volume of $5,000,000 a year.

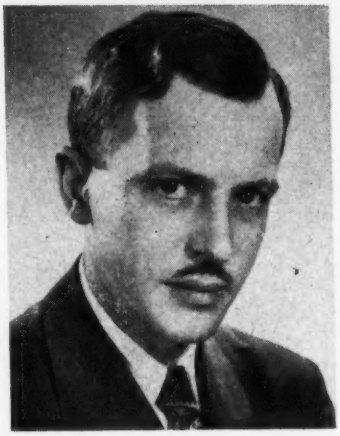
Hercules Boosts Toxaphene Capacity

Expanded plant facilities, recently completed by Hercules Powder Co., will double the production of Toxaphene, according to company officials. Toxaphene, a chlorinated camphene, is manufactured at the company's Brunswick, Ga., plant, which may be further extended next year.

The preliminary results of the extensive field tests being conducted by the United States Department of Agriculture and State Agricultural Experiment Stations, show that Toxaphene effectively controls cotton insects to substantially increase the yield of cotton.

Good results have also been obtained using Toxaphene in the control of the grasshopper, Mexican beetle, tobacco hornworm and budworm, sugar cane borer and aphid, rice stinkbug, and other insect pests which attack truck garden crops.

Lever Bros. Names Schreiber



Frederick W. Schreiber has joined the Pepsodent Div., Lever Bros. Co., as chief control chemist. He goes to Pepsodent from Personal Products Corp., a division of Johnson & Johnson.

Hood Chemical Opens Ohio Unit

A new chemical plant has been opened in Lisbon, Ohio, by the Hood Chemical Co., according to Leonard S. Mudge, president.

The new plant is another step in the company's expansion program designed to increase production of bleaches, cleaners and other household products.

The Crescent Chemical Corp. purchased earlier this year by Hood, and now a division of the company, has been moved to the new plant at Lisbon.

Enter Retail Field with Rug Anti-Slip

Now being packaged for retail sale is a new rubber-plastic liquid, Griptex, which is designed to make rugs skid-proof, fray-proof and sprout-proof. Previously, this product has been sold only to rug makers, according to its manufacturer, Adhesive Products Corp., New York.

The specialty can be easily applied to the back of a rug by brush to form a tough, flexible film which apart from imparting skid-proof qualities, also anchors each individual tuft to prevent fraying and unraveling. It is also claimed

New Non Ionic Emulsifiers
the
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to prevent rugs from buckling and curling at the edges.

At present, the new item is being marketed in quart cans.

U. S. Rubber Promotes Holmberg

Albert W. Holmberg, made manager of latex, Lotols and dispersions, Naugatuck Chemical Div., U. S. Rubber Co. He has been with the sales department of Naugatuck for the last four years.

Expand Vegetable Oil Facilities

An additional $6.2 million will be invested in plant expansions by Archer-Daniels-Midland Co., vegetable oil processor, bringing the total scheduled expenditures for 1947-48 to some $15 million.

Major projects on the books include a flaxseed-soybean solvent extraction unit at Minneapolis, an extraction unit at Decatur, and a processing mill, linseed oil refinery and feed plant at Kenedy, Texas.

Eleven other expansion, or modernization, developments are now underway.

Lehn & Fink Opens Illinois Plant

Lehn & Fink Products Corp., manufacturer of disinfectants and cosmetics, has opened a new $2 million factory at Lincoln, Ill.

The major facility includes a one and two story factory, office building and tank storage unit.

Pfizer Investigates Penicillin Derivative

A new salt of penicillin, procaine penicillin, has been developed by Chas. Pfizer & Co., New York.

The compound eliminates some of the disadvantages of currently available absorption-dosage forms of penicillin, according to the manufacturer. It is a crystalline, water-insoluble salt of procaine—widely used as a local anesthetic —and penicillin.

Early clinical research with procaine penecillin in oil indicates that a single intramuscular injection of 300,000 units in man results in detectable penicillin blood levels lasting 24 to 48 hours.

The compound will not be made available in quantity until clinical work has been completed.

Johnson Promotes Wax Finish for Rubber

A new pre-cure wax finish for molded, extruded or calendared rubber products has been developed by Johnson's Wax Co., Racine, Wisconsin.

Known as Johnson's #3037 Pre-Cure Finish, it not only prevents sticking during storage of pre-cured stock, but serves as a mold release as well. There is no mold "build-up" through carbonizing and the wax finish also eliminates a final cleaning operation.

Wax permeates the surface of finished products giving a smooth, dry finish. Being water-dispersed, the wax may be applied without fire hazard. No expensive application equipment is required, as the wax may be applied by conventional spray, dip or flow-coat methods.

Chlordane Suggested for Ant Control

Chlordane is reported to give exceptionally good control of ants in turf as a result of tests conducted by the Connecticut Agricultural Experiment Station.

The material was found effective in the destruction of *Lesius niger*, the miniature brown ant encountered more often than any other species in turf, and to give excellent conrtol of other species.

P. & G. Expands at Kansas City

A five-story addition and a granule soap drying tower will be constructed at Kansas City this winter by the Procter & Gamble Manufacturing Company as part of its national expansion program.

Work on the new manufacturing facilities is expected to start before Nov. 1 with The H. K. Ferguson Co., industrial engineers and builders, in charge of design and construction.

Adaptable to the manufacture of various types of granulated soap and synthetic detergents, the addition will be similar to units already in operation at other Procter & Gamble plants.

Klem Doubles Plant Size

Klem Chemical Works, Dearborn, Mich., has recently been incorporated as Klem Chemicals, Inc., and construction is now under way which will more than double the concern's productive capacity.

Main products of the company are metal treating chemicals, including Minit-Kote, Rust-Sol, Sol-Flux and cleaners and strippers.

KOPPERS

coal-tar chemicals

BENZOL
TOLUOL
XYLOL
PHENOL
CRESOLS
XYLENOLS
CRESYLIC ACID
CRYSTAL FREE NEUTRAL OIL
TAR ACID OILS
PYRIDINE
PICOLINES
LUTIDINES
QUINOLINE
NAPHTHALENE
AMMONIUM THIOCYANATE
SULPHATE OF AMMONIA
AND OTHER COAL TAR CHEMICALS

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Tar Products Division
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CHEMICAL MARKETS

Beeswax Output and Price Maintained

Demand for beeswax has continued postwar, in greater volume than previously, and at higher prices, leading the Department of Commerce to a conclusion that some of the war developed uses have been maintained.

During the war, between 1 and 2,000,000 pounds of beeswax were consumed annually by the armed services, in preparations used as coatings to protect and lubricate shells, to protect fighter planes, in preparing camouflage materials for tropical use, for waxing pulley cables, protection of boots and shoes, making aircraft models, for chemical warfare purposes, in burn ointments, and numerous other products.

It was already widely used in cosmetics, church candles, polishes, adhesive tape, cable coatings, carbon paper, crayons, plastics, inks, etc. United States production of beeswax has risen steadily in the past 6 years, reaching approximately 4,400,000 pounds in 1946. However, the domestic supply is short of demand and must be augmented by imports. United States imports in 1946 amounted to 6,395,173 pounds, valued at $2,930,731, compared with 4,746,712 pounds, valued at $1,065,478, in 1940. World production is estimated at something over 40,000,000 pounds annually.

Due to the claim that domestic beeswax does not bleach as readily as a large part of the imported variety, especially Brazilian and Egyptian waxes, there is a reported trade preference for imported wax and a consequent higher price.

Adequate Supply of Wood Preservatives

Although domestic creosote production remains below prewar requirements blending practices and extensive use of substitute preservatives are stretching supplies to the point that the nation's 240 wood-preserving plants can be expected to maintain their high-level output during the remainder of this year, J. F. Linthicum, Chicago, president of American Lumber and Treating Co., said recently.

The total 1947 production or railroad crossties, transmission poles, construction lumber and other forest products alloyed with chemicals to resist rot and insects will exceed 3½ billion board feet, he estimated.

Supplemented by approximately 18 millio gallons being imported from England, current creosote production by coal-tar distillers and coke-oven operators is approximately 18 per cent over 1946, according to the U. S. Tariff Commission. Monthly production averaged 13,969,817 gallons to July 1.

At the present rate, domestic creosote production will be 32 million gallons below 1941 when the wood-preserving industry consumed 200 million gallons. Englands' exportation of the preservative this year will be less than half the normal prewar annual total.

In addition to blends with creosote, wood preservers are making wider use of comparatively new and more specialized preservatives like "Wolman" salts, chromated zinc chloride. These water-soluble salt types, introduced 20 years ago compared to over a century of creosote usage, previously were employed only where the odor, inflammability or skin-irritating properties of creosote were objectionable or where it was necessary to paint the treated wood. Pentachlorphenol is also atracting more than casual interest.

Other approaches have been made. Two new West Coast plants use a creosote-type preservative distilled from petroleum oil tar. Northern railways have employed lignite-tar creosote produced from lignite coal. Watergas-tar creosote also is used. Attempts have also been made to fortify petroleum with oil-soluble toxic compounds.

Sulfur Output at New Peak

A record production of 391,396 long tons of native sulfur was attained in August 1947, according to the Bureau of Mines. Production exceeded sales by 6,240 long tons, and consequently stocks, which have been decreasing steadily, showed a slight increase for the first time since October 1946.

Period	*Production*	*Mine shipments*
July 1947	382,674	459,326
August 1947	391,396	403,005
August 1946	356,355	384,938
Jan.-August 1947	2,814,419	3,219,316
Jan.-August 1946	2,485,094	2,658,784
Monthly average 1947	351,802	402,415
Monthly average 1946	310,637	332,348

Sales of Emulsion Paints Dip

Manufacturers' sales of water-thinned paints decreased in August compared with July, according to the Bureau of the Census. A survey of four major types of water-thinned paints disclosed that substantial declines occurred in the sales of resin emulsion paints, cold-water paints and calcimines. Only plastic-texture paints registered an increase.

Resin emulsion paint sales amounted to 665,000 gallons, a decrease of 13 per cent from the July total of 767,000 gallons. All types of cold-water paints except the glue bound interior type sold in smaller quan-

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See Sweets Files, Chemical Engineering Catalog, Refinery Catalog, etc.

tities this August than during either August of last year or July of this year.

Calcimine sales totaled slightly more than 1,300,000 pounds, 10 per cent below the previous month and 31 per cent below August 1946. Sales of plastic-texture water paints rose to over 3,300,000 pounds, well above the July 1947 and the August 1946 figures. Sales of these materials is second only to March of this year when 3,600,000 pounds of plastic-texture water paints were sold.

Report Summarizes Year's Output of Organics

The United States Tariff Commission has issued a preliminary report on the 1946 production and sales in the United States of synthetic organic chemicals and their raw materials. This report gives separate data on raw materials, intermediates, and finished products.

Finished products are grouped according to use as dyes, lakes and toners, plastics materials, synthetic elastomers, plasticizers, rubber-processing chemicals, surface-active agents, flavor and perfume materials, medicinals, and miscellaneous chemicals. Statistics are given for each individual chemical whenever the data may be published without revealing the operations of individual companies.

The report shows that production of tars in 1946 amounted to 837 million gallons, compared with an output of 899 million gallons in 1945, a decrease of 62 million gallons. This decrease was reflected in a decline in the output of tar crudes. Production of benzene amounted to 135 million gallons compared with 156 million gallons in 1945; toluene, 33 million gallons compared with 132 million gallons; and naphthalene, 242 million pounds compared with 288 million pounds.

Production of crude products from petroleum and natural gas for chemical conversion increased to 3.5 billion pounds in 1946 compared with 3.3 billion pounds in 1945. Sales amounted to 3.2 billion pounds, valued at 167 million dollars.

According to the report, the total production in 1946 of intermediates and finished chemical products was over 14 billion pounds; sales were 9.5 billion pounds, valued at 2 billion dollars. Increased production was reported for most chemicals the output of which was subject to restrictions during the war. In 1946 the output of dyes totaled 186 million pounds and that of plastics materials 994 million pounds, compared with 145 million and 818 million pounds, respectively, in 1945.

Production of other chemicals, the manufacture of which had been especially stimulated by wartime demand, generally decreased in 1946 compared with the preceding years. The output of synthetic rubbers was 1.7 billion pounds in 1946 or almost 200 million pounds less, and that of plasticizers 115 million pounds or 56 million pounds less, than in 1945.

Copies of the preliminary report may be obtained by writing to the Secretary, United States Tariff Commission, Washington 25, D. C., or from the Commission's office in Room 513, the Customs House, New York, N. Y.

Natural and Manufactured Rubbers Approach Balance

U. S. industry consumed more crude rubber during the first seven months of 1947 than it had ever used in an entire year prior to World War II.

Consumption through July was at an all-time record of 650,293 long tons, 13.97% ahead of consumption for the same period last year. This was despite a seasonal decline in monthly consumption from June.

In its monthly report on consumption, The Rubber Manufacturers Association reported use in July of 78,309 tons of natural and manufactured rubber, a decline of 7.99% from June. The industry consumed an additional 21,025 tons of reclaimed rubber in July, 1.21% less than in the preceding month.

The report indicated an approaching balance between natural and manufactured rubbers. In the seven months the industry used 299,064 tons of natural rubber, and 351,229 tons of the various types of manufactured rubbers.

Lead Industry in 1946

Lead production from domestic mines dropped 14 per cent in 1946, and, for the first year on record, was exceeded by the smelter production of secondary lead. The supply of refined lead available for consumption continued to decline despite an advance in price to an unprecedented 12.55 cents per pound at the year's end.

Domestic mine production of lead and refinery output from domestic ores and base bullion declined to the lowest levels since 1935 and 1933, respectively. Total output of refined lead at primary refineries fell 25 per cent and antimonial lead production decreased 11 per cent. Imports of lead-bearing materials urgently needed to offset the decreasing domestic mine output dropped to the lowest level since 1939.

Primary refineries in the United States in 1946 produced 346,210 short tons of refined lead, a decline of 25 per cent from the 1945 output of 462,110 tons. Of the 338,197 tons of primary lead produced in 1946, domestic ores and base bullion supplied 87 per cent and 13 per cent was derived from foreign ores and imported base bullion, compared with 80 and 20 per cent, respectively, in 1945.

Antimonial lead production at primary refineries decreased 11 per cent to 50,480 tons in 1946. The quantity of antimony contained in antimonial lead produced in 1946 dropped to 6.5 per cent owing to a greater demand for low-percentage alloys.

MORE NEW ORGANIC CHEMICALS NOW AVAILABLE

In Research Quantities

PRODUCTS	°C	UNIT OF SALE
iso-Phthalic Acid C_6H_4-1, 3-$(COOH)_2$	M.P. 339-343	100 g.
tere-Phthalic Acid C_6H_4-1, 4-$(COOH)_2$		10 g.
ortho-Toluic Acid $CH_3C_6H_4COOH$	M.P. 104-105	100 g.
meta-Toluic Acid $CH_3C_6H_4COOH$	M.P. 109-112	100 g.
para-Toluic Acid $CH_3C_6H_4COOH$	M.P. 178-180	100 g.
ortho-Ethoxyphenol 2-$C_2H_5OC_6H_4$-1-OH	M.P. 27-28	500 g.
para-Cyanobenzonitrile CNC_6H_4COOH	M.P. 213-214	10 g.
para-Chlorobenzonitrile ClC_6H_4CN	M.P. 91-92	100 g.
meta-Nitrobenzonitrile $NO_2C_6H_4CN$	M.P. 115-116	10 g.
para-Nitrobenzonitrile $NO_2C_6H_4CN$	M.P. 145-146	10 g
alpha-Naphthonitrile $C_{10}H_7CN$	M.P. 31-32	10 g.
Propionitrile (Pract.) CH_3CH_2CN	B.P. 96-97	500 g.
n-Butyronitrile $CH_3(CH_2)_2CN$	B.P. 117-119	100 g.
n-Capronitrile $CH_3(CH_2)_4CN$	B.P. 161-164	100 g.
ortho-Tolunitrile $CH_3C_6H_4CN$	B.P. 93-94/18 mm	100 g
meta-Tolunitrile $CH_3C_6H_4CN$	B.P. 89-90/11 mm	100 g.
para-Tolunitrile $CH_3C_6H_4CN$	M.P. 25-27	100 g.
Benzonitrile C_6H_5CN	B.P. 188-189	100 g.
meta-Nitrobenzonitrile $NO_2C_6H_4CN$	M.P. 115-116	10 g.
meta-Nitrophenol $NO_2C_6H_4OH$	M.P. 96-97	100 g.
para-Aminobenzoic Acid $NH_2C_6H_4COOH$	M.P. 187-188	500 g.
Methyl-p-Toluenesulfonate $CH_3C_6H_4SO_2O$-CH_3	M.P. 27-28	1 Kg.
n-Capryl Aldehyde $CH_3(CH_2)_6CHO$	B.P. 167-172	100 g.
n-Valeraldehyde $CH_3(CH_2)_3CHO$	B.P. 102.5-104.5	100 g.
iso-Valeraldehyde $(CH_3)_2CHCH_2CHO$	B.P. 91.5-93.5	100 g.

NEW ORGANIC CHEMICALS

A number of organic compounds heretofore unavailable except in the most limited quantities are in research or pilot plant scale production. Inquiries invited.

Send for Products List of 50 Rare Organics now available.

GENESEE RESEARCH CORPORATION
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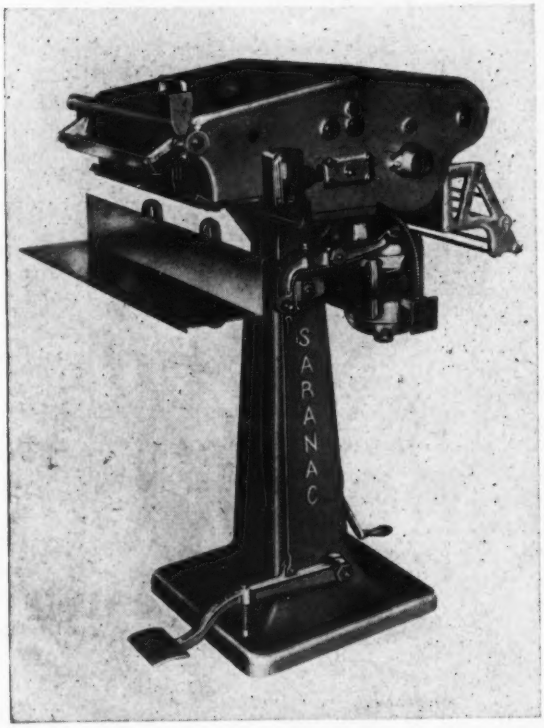
SARANAC'S BAG SEALER

FOR A *Sift-Proof Seal*



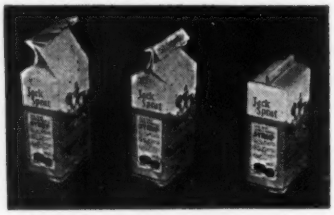
Standard Model D-10" Sealer (With motor drive and single pedal control)

Saranac Bag Sealing Machines make the paper bag a *real* package. The reverse double fold, formed and stapled on the Saranac Bag Sealer, is *Sift-Proof*. The same machine is used for closing the bottom ends of bag tubes as well as closing the top ends of filled bags.

Cross section of Saranac reverse double-fold

SPEED
Up to 1200 closures per hour.

NEATNESS
Reverse double fold Sift-Proof closure makes attractive counter or shelf display.



Steps in sealing bags on Saranac D-10" Bag Sealer

ECONOMY
Inexpensive staples made from wire coil. Saranac closures are Sift-Proof. Saranac reverse double fold is the strongest part of the bag.

SARANAC MACHINE CO
BENTON HARBOR, MICHIGAN

CURRENT PRICES

Chemical prices quoted are of American manufacturers for spot New York, immediate shipment, unless otherwise specified. Products sold f.o.b. works are specified as such. Import chemicals are so designated.

Oils are quoted spot New York, ex-dock. Quotations f.o.b. mills, or for spot goods at the Pacific Coast are so designated.

Raw materials are quoted New York, f.o.b., or ex-dock. Materials sold f.o.b. works or delivered are so designated.

The current range is not "bid and asked," but are prices from different sellers, based on varying grades or quantities or both.

Purchasing Power of the Dollar: 1926 Average—$1.00
October, 1945, $0.864 October, 1946, $0.767
October, 1947, $0.60

	Current		1947		1946	
	Low	High	Low	High	Low	High
Acetaldehyde, 99%, drs.wks..lb.	.11	.12	.11	.15	11	.14
Acetic Anhydride, drs.....lb.	.13	.14½	.11½	.14½	.11½	.13
Acetone, tks, delv..... ¹ω.	.07	.09	.07	.10	.06	.07
ACIDS						
Acetic, 28% bbls.....100 lbs.	3.78	4.08	3.38	4.08	3.38	3.63
Glacial, bbls.....100 lbs.	10.65	10.90	9.15	10.90	9.15	9.40
drs, wks.....100 lbs.	13.20	13.75	6.93	13.75	6.93	7.25
Acetylsalicylic, Standard USP.....lb.	.45	.59	.45	.59	.40	.59
Benzoic, tech, bbls.....lb.	.43	.47	.43	.47	.43	.47
USP, bbls., 4,000 lbs. up..lb.	....	.54	....	.54	....	.54
Boric tech, ubls. c-l..... tons a	....	137.50	....	137.50	....	109.00
Chlorosulfonic, drs, wks.....lb.	.03	.04½	.03	.04½	.03	.04½
Citric, USP, crys, gran, bbls.....lb. b	.22	.23	.20	.23	.20	.21
Cresylic 50%, 210-215° HB, drs, wks, frt. equal.....gal.	....	1.26	1.01	1.26	.81	1.04
Formic, 85%-90% cbys.....lb.	.12	.14½	.10	.14½	.10	.13
Hydrofluoric, 30% rubber, drs. .....lbs.	.08	.09	.08	.09	.08	.09
Lactic, 22%, lgt. bbls, wks..lb.	.44	.48	.039	.0415	.039	.0415
44%, light, bbls, wks.....lb.	.815	.855	.073	.855	.073	.0755
Maleic, Anhydride, drs.....lb.	.25	.26	.25	.26	.25	.26
Muriatic 18° cbys.....100 lbs.	1.50	2.90	1.50	2.90	1.50	2.45
20° cbys, c-l, wks....100 lbs.	1.85	2.00	1.85	2.00	....	1 75
22° cbys, c-l, wks...100 lbs.	2.35	2.50	2.35	2.50	....	6.00
Nitric, 36°, cbys, wks..100 lbs. c	5.00	6.30	5.00	6.30	5.00	5.25
38°, c-l, cbys, wks...100 lbs. c	2.35	5.50	....	5.50	....	5.50
40°, c-l, cbys, wks...100 lbs. c	6.00	6.50	....	6.50	....	6.00
42°, c-l, cbys, wks...100 lbs. c	6.50	7.00	....	7.00	....	6.50
Oxalic, bbls, wks.....lb.	.13	.14	.11¾	.14	.11¾	.14½
Phosphoric, 100 lb. cbys, USP.....lb.	.10½	.13	.10½	.13	.10½	.13
Salicylic tech, bbls.....lb.	.31	.38	.26	.42	.26	.42
Sulfuric, 60°, tks, wks.....ton	13.00	13.50	....	13.50	....	13.00
66°, tks, wks.....ton	16.50	17.50	....	17.50	....	16.50
Fuming 20% tks, wks....ton	19.50	20.50	....	20.50	....	19.50
Tartaric, USP, bbls.....lb.	.49½	.50	.49½	.55	.54½	.71
Alcohol, Amyl (from Pentane) tks, delv.....lb.	....	.151	....	.151	....	.131
Butyl, normal, syn, tks...lb.	....	.16½	....	.16½	....	.14½
Denatured, CD 14, c-l drs.....gal. d	....	1.04½	....	1.06	....	.90
Denatured, SD, No. 1, tks. d	....	.98	....	.98½	....	.82½
Ethyl, 190 proof tks.....gal.	18.04	18.08	18.04	18.08	....	17.94
Isobutyl, ref'd, drs.....lb.	....	.13	....	.13	....	.0860
Isopropyl ref'd, 91%, dms.....gal.	.44	.47½	.41	.50½	.38	.47
Alum, ammonia, lump, bbls, wks.....100 lbs.	....	4.25	....	4.25	....	4.25
Aluminum, 98.99%....100 lbs.	15.00	16.00	15.00	16.00	15.00	16.00
Chloride anhyd, l.c.l. wks..lb.	....	.10¼	....	.10¼	.09	.12
Hydrate, light, bgs.....lb.	....	.17	....	.17	....	.14½
Sulfate, com'l, bgs, wks, c-l.....100 lbs.	1.15	1.30	1.15	1.30	1.15	1.25
Sulfate, iron-free, bgs, wks .....100 lbs.	1.95	2.25	1.75	2.50	1.75	2.00
Ammonia anyhd, cyl.....lb.	.16	....	.14½	.20	....	.14½
Ammonia, anhyd, fert, tank cars, wks, frt. equalized..ton	....	59.00	....	59.00	....	59.00
Ammonium Carbonate, USP, lumps, drs.....lb.	.08¼	.13½	.08¼	.13½	.08¼	.09½
Chloride,whi,bbls,wks,100lbs.	4.75	5.00	4.45	5.15	4.45	5.15
Nitrate, tech, bgs, wks...lb.	.0435	.0450	.0435	.0450	.0435	.0850
Oxalate pure, grn, bbls....lb.	.23	.29	.23	.29	....	23
Perchlorate, kgs.....lb.	.25		.24	.25	no stocks	
Phosphate, dibasic tech, bgs.....lb.	.07	.07¾	.07	.07¾	.07	.07¾
Stearate, anhyd, drs.....lb.	....	.34	....	.34	....	.34
Sulfate, drs, bulk.....ton	30.00	35.00	30.00	35.00	28.20	30.00
Amyl Acetate (from pentane) tks, delv.....lb.	.21	.24	.21	.24	....	.181
Aniline, Oil, drs.....lb.	.13	.14	.12	.14	.11½	.13
Anthraquinone, sub, bbls....lb.	....	.70	....	.70	....	.70
Antimony Oxide, bgs.....lb.	.26	.27½	.21	.31	.15	.21¾
Arsenic, whi, bbls, powd....lb.	.06	.08	.05	.08	.04	.05¼

USP $25 higher; Prices are f.o.b. N. Y., Chicago, St. Louis, deliveries ½c higher than NYC prices. a Powdered boric acid $5 a ton higher; b Powdered citric acid is ½c higher; c Yellow grades 25c per 100 lbs. less in each case; d Prices given are Eastern schedule.

	Current Low	Current High	1947 Low	1947 High	1946 Low	1946 High
Barium Carbonate precip, wks, bgs ton	67.50	82.00	60.00	82.00	60.00	75.00
Chloride, tech, cryst, bgs, zone 1 ton	85.00	95.00	73.00	95.00	73.00	78.00
Barytes floated, paper bgs. ton	no prices		....	41.95	....	41.95
Bauxite, bulk mines ton	8.50	10.00	7.00	10.00	7.00	10.00
Benzaldehyde, tech, cbys, drs. lb.	.45	.55	.45	.55	.45	.55
Benzene (Benzol), 90%, tks, frt all'd gal.	....	.19	....	.19	....	.17
Benzyl Chloride, cbys lb.	.20	.28	.20	.28	.20	.24
Beta-Naphthol, tech, bbls, wks lb.	.23	.29	.21	.29	.21	.24
Bismuth metal, ton lots lb.	....	2.00	....	2.00	1.25	1.80
Blanc Fixe, 66⅔% Pulp, bbls, wks ton	55.00	60.00	40.00	60.00	40.00	46.50
Bleaching Powder, wks, 100 lbs.	2.75	3.75	2.50	3.75	2.50	3.60
Borax, tech, c-l, bgs ton	53.50	56.00	45.00	56.00	....	45.00
Bordeaux Mixture, bgs lb.	.15	.23	.11	.23	.11	.11½
Bromine, cases lb.	.21	.23	.21	.23	.21	.23
Butyl, acetate, norm, drs. lb.	.30½	.31½	.26	.33½	.1860	.26½
Cadmium Metal lb.	1.75	1.80	....	1.80	.90	1.55
Calcium, Acetate, bgs. 100 lbs.	3.00	4.00	3.00	4.00	3.00	4.00
Carbide, drs ton	50.00	90.00	50.00	90.00	50.00	90.00
Chloride flake, bgs, c-l ton	21.50	38.00	18.50	38.00	18.50	38.00
Solid, 73-75% drs, c-l ton	21.00	37.50	18.00	37.50	18.00	37.50
Cy'n'd, min. 21% N, c-l lb.	.02¼	.02¾	.02¼	.02¾	....	....
Gluconate, USP, bbls lb.	.58	.65	.57	.65	.57	.59
Phosphate tri, bbls, c-l lb.	6.50	6.80	6.50	6.80	....	.0635
Camphor, USP, gran, powd, bbls lb.	.72	.78	.75	.82	.69	.82
Carbon Bisulfide, 55-gal. drs. lb.	.05	.05¾	.05	.05¾	.05	.05¾
Dioxide, cyl lb.	.06	.08	.06	.08	.06	.08
Tetrachloride, Zone 1, 52½ gal. drs lb.	.06½	.07	.06	.07	.69	.80
Casein, Acid Precip, bgs, 10,000 lbs. or more lb.	.32	.34	.26	.35	.24	.33
Chlorine, cyls, lcl, wks, contract lb.	.09	.10½	.08¾	.10½	....	.07¼
cyls, c-l, contract lb.	....	.06¾	....	.06¾	....	.05¼
Liq, tk, wks, contract 100 lbs.	....	2.00	....	2.30	....	2.30
Chloroform, tech, drs lb.	.20	.23	.20	.23	.20	.23
Coal tar, wks, crude bbl.	9.50	10.00	8.25	10.00	8.25	9.00
Cobalt, Acetate, bbl lb.	....	.83¾	....	.83¾	....	.83¾
Oxide, black kgs lb.	1.275	1.30	....	1.30	....	1.84
Copper, metal 100 lbs.	....	21.50	21.50	24.00	12.00	14.75
Carbonate, 52-54%, bbls lb.	.24	.26	.19½	.26½	.19½	.20½
Sulfate, bgs, wks cryst. 100 lbs.	7.60	8.00	7.10	8.60	5.00	7.25
Copperas, bulk, c-l, wks ton	....	14.00	....	14.00	....	14.00
Cresol, USP, drs lbs.	.14	.15¾	.13¾	.15¾	.10¾	.14¼
Dibutylamine, c-l, drs, wks lb.	....	.76	....	.76	....	.66
Dibutylphthalate, drs lb.	.32	.34½	.29	.34½	.17	.29½
Diethylaniline, drs lb.	....	.48	....	.48	....	.48
Diethyleneglycol, drs, wks lb.	.14	.15	.14	.15	.14	.15
Dimethylaniline, drs, cl., lcl. lb.	.21	.24¼	.20	.24¼	.21	.22
Dimethylphthalate, drs lb.	.23½	.24¾	.20	.24¾	.20	.20½
Dinitrobenzene bbls lb.	....	.16	....	.16	....	.18
Dinitrochlorobenzene, dms. lb.	.14	.15½	14	.15½	....	.14
Dinitrophenol bbls lb.	....	.22	....	.22	....	.22
Dinitrotoluene, drs lb.	....	.18	....	.18	....	.18
Diphenyl, bbls, lcl, wks lb.	.16	.20	.16	.20	.16	.20
Diphenylamine bbls lb.	....	.25	....	.25	....	.25
Diphenylguanidine, drs lb.	.35	.37	.35	.37	.35	.37
Ethyl Acetate syn. 85-90% tks, frt all'd lb.	....	.09½	....	.09½	....	.09½
Chloride, USP, bbls lb.	.20	.22	.18	.22	.18	.20
Ethylene Dichloride, lcl, wks, E. Rockies, drs lb.	.08½	.09½	.08½	.09½	.0842	.0941
Gylcol, dms cl lb.	....	.12	....	.12	....	.10
Fluorspar No. 1, grd. 95-98% bulk, cl mines ton	....	37.00	....	37.00	....	37.00
Formaldehyde, bbls, cl & lcl. lb.	.0645	.0745	.0520	.0745	.0520	.0570
Furfural tech, tks lb.	....	.09½	....	.13	....	.13
Fusel Oil, ref'd, drs, dlvd. lb.	.26½	.27½	.18½	.27½	.18½	.19½
Glauber's Salt, Cryst, bgs, wks 100 lbs.	1.25	1.75	1.05	1.75	1.05	1.45
Glycerine dynamite, drs, c-l lb.	....	.29½	.29½	.75¾	.17½	.55¼
Crude Saponification, 88% to refiners tks lbs.	.23	.24	.23	.60	....	.60

GUMS

Gum Arabic, amber sorts bgs. lb.	.14	.15	.13¾	.15	.11¾	.14½
Benzoin, Sumatra, cs lb.	.50	.60	.50	1.00	.52	1.70
Copal, Congo lb.	no prices		....	no prices	....	.55¾
Copal, East India, chips lb.	no prices		....	no prices	....	.55¾
Macassar dust lb.	no prices		....	no prices	....	.07½
Copal Manila lb.	no prices		.25	....	.13½	.25
Copal Pontianak lb.	no prices		....	no prices	....	.17½
Karaya, bbls, bxs, drs lb.	.20	.51	.20	.55	.18	.50

ABBREVIATIONS—Anhydrous, anhyd; bags, bgs; barrels, bbls; carboys, cbys, carlots, c-l; less-than-carlots, lcl; drums, drs; kegs, kgs; powdered, powd; refined, ref'd; tanks, tks; works, f.o.b., wks.

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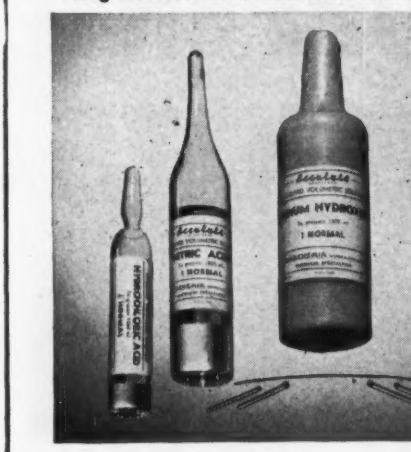

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SARGENT

SCIENTIFIC LABORATORY SUPPLIES

	Current Low	Current High	1947 Low	1947 High	1946 Low	1946 High
Kauri, N. Y.						
Superior Pale XXX ....lb.	no prices		....	nom.	....	.65¾
No. 3 ....lb.	no prices		....	nom.	....	.22
Sandarac, cks. ....lb.	no prices		.85	.95	.90	.99½
Tragacanth, No. 1, cases ....lb.	3.60	3.80	3.60	5.25	3.75	5.25
No. 3 ....lb.	2.00	2.50	2.10	3.45	2.10	3.45
Yacca, bgs. ....lb.	no prices		....	nom.	.05	.07½
Hydrogen Peroxide, cbys. ....lb.	.15½	.18½	.15½	.18½	.15½	.18½
Iodine, Resublimed, jars ....lb.	2.35	2.65	....	2.65	1.75	2.10
Lead Acetate, cryst, bbls. ....lb.	....	.19¼	....	.19¼	....	.16¾
Arsenate basic, bg, lcl ....lb.	.22¾	.23¾	....	.23¾	.12	.18
Nitrate, bbls. ....lb.	.17¾	.18	....	.18	....	.12½
Red, dry, 95% Pb_3O_4 bbls. ....lb.	.178	.18½	.14¼	.19¼	.09	.16
97% Pb_3O_4, bbls delv. ..lb.	.1785	.18¾	.15	.19½	.09½	.16¾
98% Pb_3O_4, bbls delv. ..lb.	.1810	.19	.15¼	.19¾	.08¼	.17
White, bbls. ....lb.	.16	.16¼	.13	.17¾	.07¼	.14¼
Basic sulfate, bbls, lcl ..lb.	.15¼	.15½	.12½	.15½	.07¼	.13¼
Lime, Chem., wks, bulk ....ton	6.50	10.25	6.50	10.25	6.50	10.25
Hydrated, f.o.b. wks. ....ton	8.00	12.14	8.00	12.14	8.50	12.00
Litharge, coml, delv, bbls. ....lb.	.1660	.17½	.13	.17½	.08	.15¼
Lithopone, ordi., bgs. ....lb.	.05½	.06	.04	.06	.04¼	.05¼
Magnesium Carb, tech, wks. .lb.	.07¼	.10¾	.07¼	.10¾	.07¼	.10¾
Chloride flake, bbls, wks c-l. ....ton	....	37.00	....	37.00	....	32.00
Manganese Chloride, Anhyd. bbls. ....lb.	.14	.16	.14	.16	.14	.18
Dioxide, Caucasian bgs, lcl ....ton	74.75	79.75	74.75	79.75	74.75	79.75
Methanol, pure, nat, drs. .gal. *l*	.63	.73	.63	.73	.63	.73
Synth, drs cl. ....gal. *m*	.34½	.41½	.31	.41½	.24	.38
Methyl Acetate, tech tks. ....lb.	.06	.07	.06	.07	.06	.07
C.P. 97-99%, tks, delv. .lb.	.09½	.10½	.09½	.10½	.09½	110½
Chloride, cyl. ....lb.	.33	.41	.32	.41	.32	.40
Ethyl Ketone, tks, frt all'd .lb.	....	.09	....	.09	....	.09
Naphtha, Solvent, tks. ....gal.	....	.28	....	.28	....	.27
Naphthalene, crude, 74°, wks. tks. ....lb.	bo prices		.035	.083	.0275	.035
Nickel Salt, bbls, NY. ....lb.	.14	14½	.14	.14½	.13	.14½
Nitre Cake, blk. ....ton	20.00	24.00	....	24.00	....	16.00
Nitrobenzene, drs, wks. ....lb.	.08½	.10	.08	.09½	.08	.09
Orthoanisidine, bbls. ....lb.	....	.70	....	.70	....	.70
Orthochlorophenol, drs. ....lb.	....	.37	.25	.37	.25	.27
Orthodichlorobenzene, drs. ..lb.	.07½	.10½	.07	.10½	.07	.08
Orthonitrochlorobenzene, wks ....lb.	.15	.18	.15	.18	.15	.18
Orthonitrotoluene, wks, drs. .lb.	.08	.09	.08	.09	....	.09
Paraldehyde, 98%, wks lcl ..lb.	.12½	.13	.22	.13	....	.12
Chlorophenol, drs. ....lb.	.25	.29	.24	.29	.24	.27
Dichlorobenzene, wks. ....lb.	.12½	.14	.12½	.14	.11	.17
Formaldehyde, drs, wks. ..lb.	.21	.22	....	.22	.21	.22
Nitroaniline, wks, kgs. ....lb.	.41	.43	.41	.43	.41	.45
Nitrochlorobenzene, wks. .lb.	....	.15	....	.18	....	.18
Toluenesulfonamide, bbls. .lb.	....	.70	....	.70	....	.70
Toluidine, bbls, wks. ....lb.	.44	.53	....	.53	....	.48
Penicillin, ampules per 100,000 units, bulk	....	.19	....	.38	.38	.95
Pentaerythritol, tech. ....lb.	.32	.36	.27	.36	.27	.31

PETROLEUM SOLVENTS AND DILUENTS

Lacquer diluents, tks, East Coast ....gal.	.13	.13½	....	.13	.11½	.12½
Naphtha, East tks, wks. ....gal.	.11	.11½	....	.11	.11	.12
Rubber solvents, East, tks, wks ....gal.	.12½	.13	....	.12	.11	.12
Stoddard Solvents, East, tks, wks. ....gal.	.11½	.12	....	.12	.10	.12

Phenol, U.S.P., drs. ....lb.	.11¼	.13¼	.11¼	.13¼	.10½	.13¼
Phthalic Anhydride, cl and lcl, wks. ....lb.	.14½	.18½	.14½	.15½	.13	.15½
Potash, Caustics, 88-92%, wks, sol ....lb.	.06¾	.07½	.06¼	.07½	.06¼	.06¾
Flake, 88-92% ....lb.	.07½	.08¼	.07	.08¼	.07	.07½
liquid, 45% basis, tks. ..lb.	....	.03¼	....	.03½	....	.02¾
drs, wks. ....lb.	.0337½	.0375½	.03¼	.04	.03	.03½
Carbonate, hydrated 83-85%, bbls. ....lb.	.05¾	.06	.06	.05¾	....	.05½
Chlorate crys, kgs, wks. ..lb.	.08½	.09¾	.08½	.13	.11	.13
Chloride, crys, tech, bgs, kgs. ....lb.	.08	nom.	.08	nom.	.08	nom.
Cyanide, drs, wks. ....lb.	....	.55	....	.55	....	.55
Iodide, drs. ....lb.	1.95	1.98	1.44	1.98	1.44	1.48
Muriate dom, 60-62-63% K_2O bulk unit-ton	.37½	.53½	.37½	.53½	.53½	.56½
Permanganate, USP, wks drs. ....lb.	.22½	.23	.20½	.23	.20½	.21
Sulfate, 90%, basis, bgs. .ton	36.25	39.25	36.25	39.25	36.25	39.25
Propane, group 3, tks. ....gal.	....	.03½	....	.03¾	....	.03¾
Pyridine, ref., drs. ....lb.	.60	.65	.55	.65	.45	.55½
R Salt, 250 lb. bbls, wks. ..lb.	.61	.72	....	.72	....	.65
Resorcinol, tech, drs, wks. ..lb.	....	.68	.64	.74	.64	.74
Rochelle Salt, cryst. ....lb.	.34½	.35	.34½	.35	.34½	.47
Salt Cake, dom, blk wks. ..ton	20.00	26.00	....	26.00	....	15.00
Saltpeter, grn, bbls. ....100 lbs.	8.00	9.50	8.20	9.50	8.20	9.00

l Producers of natural methanol divided into two groups and prices vary for these two divisions; *m* Country is divided into 4 zones, prices varying by zone. Spot price is ½c higher.

Current Prices

Oils & Fats
Shellac

	Current Low	Current High	1947 Low	1947 High	1946 Low	1946 High
Shellac, bichd. bone dry, bbls. lb.	.58½	.59	.65	.74½	.42½	.74½
Silver Nitrate, bots, 2,500-oz. lots oz.	.42¼	.45½	.42¼	.59	.47	.59
Soda Ash, 58% dense, bgs, c-l, works 100 lbs.	....	1.38	....	1.38	....	1.28
58% light, bgs cl 100 lbs.	....	....	....	1.30	1.05	1.20
Caustic, 76% flake drs, cl 100 lbs.	....	3.00	2.90	3.00	....	3.00
76% solid, drs, cl 100 lbs.	....	2.60	2.50	2.75	....	2.75
Liquid, 47-49%, sellers, tks 100 lbs.	....	2.10	....	2.10	....	2.10
Sodium Acetate, anhyd. drs lb.	.06½	.11	.06½	.11	.08½	.10
Benzoate, USP drs lb.	.46	.52	.46	.52	.46	.52
Bicarb, USP, gran., bgs., cl., works 100 lbs.	..	2.25	2.25	2.59	1.55	2.59
Bichromate, bgs, wks l.c.l. lb.	.08¾	.08½	.07⅞	.08⅜	.07⅞	.08½
Bisulfate powd, bbls, wks 100 lbs.	3.00	3.60	3.00	3.60	3.00	3.60
35° bbls., wks 100 lbs.	1.40	1.65	1.40	1.65	1.40	1.65
Chlorate, kgs, wks c.l. lb.	....	.06¼	....	.06½	....	.06¼
Cyanide, 96-98%, drs lb.	.14½	.15	.14½	.15	.14½	.15
Fluoride, 95%, bbls, drs lb.	.09¾	.10	.07¾	.10	.07¼	.08¼
Hyposulfite, cryst, bgs, cl, wks 100 lbs.	....	2.75	....	2.75	....	2.25
Metasilicate, gran, bbl, wks c-l 100 lbs.	....	3.40	....	3.40	....	3.40
Nitrate, imp, bgs ton	....	42.50	....	42.50	33.00	38.50
Nitrite, 96-98% bbl. cl lb.	....	.06¾	....	.06¾	....	.06¾
Posphate, dianhyd. bgs, wks 100 lbs.	6.25	7.00	6.00	7.00	6.00	6.75
Tri-bgs, cryst, wks 100 lbs.	3.50	3.90	2.70	3.90	2.70	3.10
Prussiate, yel. bbls, wks. lb.	....	.12¼	..	.12¼	..	.11
Silicate, 52°, drs, wks 100 lbs.	1.55	2.00	1.40	2.00	1.40	1.80
40°, drs, wks, c-l 100 lbs.	.95	1.15	....	1.15	....	.80
Silicofluoride, bbls, NY lb.	.07½	.08½	.06½	.08½	.06½	.10
Sulfate tech, Anhyd, bgs 100 lbs.	2.10	2.60	1.70	2.60	1.70	2.20
Sulfide, cryst c-l, bbls, wks 100 lbs.	....	3.25	....	3.00	....	2.40
Solid, bbls, wks lb.	3.50	5.50	3.05	5.50	3.15	3.90
Starch, Corn, Pearl, bgs 100 lbs.	6.37	7.17	4.90	7.17	4.321	6.271
Potato, bgs, cl lb.	.08¾	.09¼	.08¾	.09¼	.0735	.0760
Rice, bgs lb.	no stocks		no stocks		no stocks	
Sweet Potato, bgs lb.	no stocks		no stocks		no stocks	
Sulfur, crude, mines ton	16.00	18.00	16.00	18.00	....	16.00
Flour, USP, precp, bbls, kgs lb.	.18	.30	.18	.36	.18	.36
Roll, bbls 100 lbs.	2.65	3.40	2.65	3.40	2.40	3.40
Sulfur Dioxide, liquid, cyl. lb.	....	.085	.07	.095	.07	.08
tks, wks lb.	....	.044	....	.044	....	.04
Talc, crude, c-l, NY ton	....	15.00	....	15.50	....	15.50
Ref'd, c-l, NY ton	14.50	24.50	14.50	24.50	13.00	21.00
Tin, crystals, bbls, wks lb.	.55	.60	....	.60	no stocks	
Metal lb.	....	.80	....	.80	....	.70
Toluol, drs, wks gal.	..	.28	....	.28	.27	.32
tks, frt all'd gal.	..	.23	....	.23	.22	.27
Tributyl Phosphate, drs, lcl, frt all'd lb.	.68	.72	....	.72	....	.65
Trichloroethylene, drs wks. lb.	.09¼	.10½	.08	.10½	.08	.09
Tricresyl phosphate tks lb.	.32½	.33	.32¼	.33	....	.32
Triethylene glycol, drs lb.	.18½	.19½	.18½	.19½	.18½	.19½
Triphenyl Phos., bbls lb.	.26	.27	.26	.32	.26	.32
Urea, pure, cases lb.	....	.12	....	.12	....	.12
Wax, Bayberry, bgs lb.	no stocks		no stocks		no stocks	
Bees, bleached, U.S.P. cakes lb.	.65	.72	.68	.72	.60	.70
Candelilla bgs, crude lb.	.62	.65	.62	.80	.62	.86
Carnauba No. 1, yellow, bgs, ton lb.	1.30	1.33	1.30	2.00	1.80	2.04
Xylol, Indus., frt all'd, tks, wks gal.	.23	.25	....	.23	...	.26
Zinc Chloride tech, fused, wks lb.	.06¼	.0655	.05	.0655	.05	.0535
Oxide, Amer., bgs, wks lb.	.095	.0975	.09	.09¾	.07	.09¼
Sulfate, crys, bgs 100 lbs.	4.15	4.90	3.40	4.90	3.40	4.15
OILS AND FATS						
Babassu, tks lb.	.14½	....	.14½	...	.11	.12
Castor, No. 3, drs, c.l. lb.	.27¾	.34¼	.27¾	.34¾	....	.29¾
China Wood, drs, spot NY lb.	.25¾	.27	.24	.41	.39	.41
Coconut, edible, drs NY lb.	no prices		no prices			.0985
Cod, USP, bbls, drs gal.	2.40	3.50	2.40	3.80	2.15	3.80
Corn, crude, tks, wks lb.	.18	.24½	.18	.37	....	.27
Linseed, Raw, drs, c.l. lb.	.3210	.	.3210	.3960	.1680	.3640
Menhaden crude tks lb.	.19	.20	.19	.20	.1220	.21½
Light, pressed, drs l.c.l. lb.	.16	.19	.16	.29	.1300	.29
Palm, Niger, dms lb.	no prices		no prices		....	.0865
Peanut, crude, tks, f.o.b. wks lb.	.17	nom	.20	.37	.12¾	.28½
Perilla, crude, dms, NY lb.	no stocks		no stocks		no stocks	
Rapeseed, bulks lb.	no prices		no prices		....	.13
Red, dms lb.	.17¾	.21¼	.17¾	.33¾	.13¼	.30¼
Soy Bean, crude, tks, wks lb.	.15½	.16	.15¼	.33	.1175	.2450
Tallow, acidless, dms lb.	.19½	nom	.19½	.34½	....	.14¼

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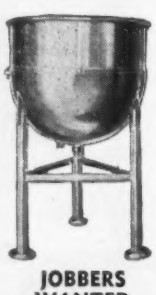

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1—Rotary Steam Tube Dryer 6'x25'.
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2—Mikro Pulverizers, 1SH, Bantam.
1—Gruendler Master Hammer Mill, 10HP.
7—Duriron, Lead Haveg Pumps, 1" to 3".
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"WE"— EDITORIALLY SPEAKING

WE ALWAYS KNEW that General Electric's activities were diverse, but we didn't know until last month, when we visited its new silicone plant at Waterford, New York, that the company was an official grave-tender.

The plant office up there faces the highway, beyond which—about a quarter of a mile away—is the pump-house on the Hudson River bank. Between the road and the river is a little square of ground surrounded by a white picket fence, and in that little plot is buried the founder of Waterford together with his ancestors and descendants. Some of the graves date back to 1759.

The land which G-E bought includes this family burial plot, and one of the stipulations of the sale was that General Electric maintain the graves *in aeternum.*

So now Superintendent Nisbet not only has to worry about silicon and methyl chloride, but also about grass seed and paint for the white picket fence.

AMONG THE CONSTANTLY RECURRING grist for the mill of popular scientific magazines are (1) the migration of lemmings, (2) the possibility of life on Mars, and (3) the lost continent of Atlantis. Now another old standby from the days of Archimedes, viz., harnessing the radiant heat of the sun, has turned up again. French scientists are getting temperatures as high as 3300° C. with mirrors, and any day we're expecting to hear that a Norwegian lemming has turned up in Newfoundland.

AN ACS NEWS SERVICE release tells us that "in ancient civilizations knowledge and education was not common, but was exclusive to the scared few." That's life, we say, the higher classes sitting in fear and trembling over the revolutionary masses below.

WE'VE BEEN HAVING a summer-like autumn here in New York, but we're worried about that long-overdue cold snap. Dr. William F. Petersen, director of clinical research at St. Luke's Hospital, Chicago, says that we men are more likely to kick the bucket when the temperature is falling. Women, perverse as usual, pop off when the thermometer is going up. Behind the whole thing, apparently, are those darn sun spots, which seem to have more influence on the affairs of men than they have any right to.

FIFTEEN YEARS AGO
(From Our Files of Nov., 1932)

Grasselli Medal is presented to Prof. George L. Clark, University of Illinois. His paper is titled "A Decade of Applied X-Ray Research."

Goodrich's George Oenslager is the 1933 choice for the Perkin Medal, for his contributions to rubber technology.

The fertilizer industry is complaining bitterly at the increasing volume of imports. Anti-dumping orders have been issued against Belgium, Poland and Germany on ammonium sulfate, but to date nothing definite has been decided upon in the case of Japan, from which country over 6,000 tons were imported during September.

Chemicals will bear the brunt of the attack on American imports in Canada's new tariff act. The result of the Ottawa Conference is a closed door to American chemical producers on a number of very important items. It is likely to force American producers into the establishment of branch plants.

THIRTY YEARS AGO
(From Our Files of Nov., 1917)

U. S. Government prepares to make German chemical patents available to American industry through the Trading With The Enemy Act.

Hundreds of chemists, drafted, are returned from cantonments and assigned to chemical work.

National Aniline plans to make vat dyes and applies for application to use German patents.

American Agricultural Chemical buys 3,400 acres of phosphate land in Florida to be developed after the end of the war.

Kuttroff, Pickardt purchases dyestuffs stocks of Badische Co., N. Y., and takes over staff and laboratories.

American Trona and American Borax are hampered in Searles Lake potash plans by lack of satisfactory leasing arrangements from the Government.

Union Carbide & Carbon Corp. of Niagara Falls, is incorporated under the laws of New York with 3,000,000 shares common stock; active capital $15,000,000.

OUR ELEPHANTINE MEMORY serves us well. When we read about the recent plague of locusts in Sardinia, we recalled that 15 years ago we reported: "An announcement from abroad states that soap can be made from locusts, which are one of the plagues of North Africa. The locusts are dried in the sun and treated with carbon disulfide or ethyl chloride, according to their degree of dryness. The oil thus obtained is then purified by steam and used for making soap."

We do hope the Sardinians consulted the local library and turned their pests into profit—especially in these oil-short days.

"Thank you, Dr. Snapper, for your inspiring remarks on our company's research plans."

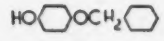
WE SEE BY THE PAPER where a Monsanto man has up and gone to Elizabeth Arden, where he will serve the cosmetics industry . . . which serves womankind.

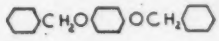
CONFUSION AT DU PONT: "L. H. Priday, plant manager at Parlin, N. J., was transferred to Wilmington. . . . H. L. Priddy, now assistant plant manager at Parlin, will become plant manager there."

We had to read that twice; that Priday-Priddy business was too much for us. Now the Parlin folks will have to learn to say "Good morning, H. L." instead of "Good morning, L. H."

Good-rite CHEMICALS

Ethers of Hydroquinone


Monobenzyl Ether of Hydroquinone


Dibenzyl Ether of Hydroquinone

Monobenzyl ether of hydroquinone may be used as an antioxidant, stabilizer, or plasticizer in pharmaceuticals, paints, varnishes, and organic synthesis.

Dibenzyl ether of hydroquinone may be used as a high boiling solvent for perfumes, cosmetics, pharmaceuticals, plasticizers, paints, varnishes, and organic synthesis.

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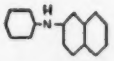
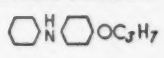
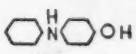
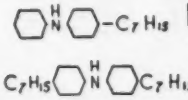
Secondary Aromatic Amines

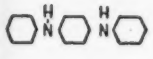

Phenyl B-Naphthylamine

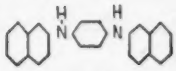

p-Isopropoxy Diphenylamine


p-Hydroxy Diphenylamine

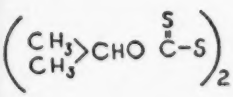

Mixed Mono and Diheptyl Diphenylamines

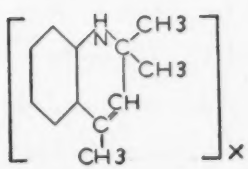
Di-secondary Aromatic Amines

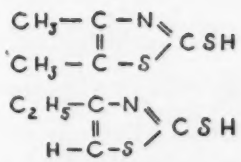

Diphenyl p-Phenylenediamine

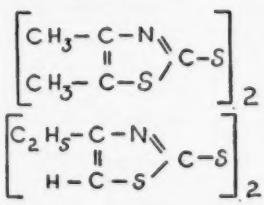

Di B-Naphthyl p-Phenylenediamine

Miscellaneous


Di-Isopropyl Dixanthogen


Trimethyl Dihydro Quinoline Polymer.


Mixed Ethyl and Dimethyl Mercaptothiazoles


Mixed Aliphatic Thiazyl Disulfides

N-Nitroso Diphenylamine

All materials listed here are available in commercial quantities. Prices and technical information are available on request. Please write Dept. CE-11, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio.

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A Complete Checklist Covering Chemical Products and Processes

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U. S. Patents from Official Gazette—Vol. 600, Nos. 1, 2, 3, 4 (July 1—July 22)
Canadian Patents Granted and Published August 26—September 30

*Organic

Catalytically reducing saccharide comprises exposing saccharide in aqueous solution to action of hydrogen with agitation and heat in presence of base metal hydrogenation catalyst and of metallic magnesium in discreate particulate form. No. 2,421,416. Leo Aaron Flexser to Hoffmann-La Roche, Inc.

Treating hydrocarbon of high-molecular-weight to produce asphaltic product. No. 2,421,421. Arnold J. Hoiberg to Lion Oil Company.

Interpolymerization of isobutene and isopentenes in presence of sulfuric acid. No. 2,421,422. George Chrysler Johnson to Socony-Vacuum Oil Company, Inc.

In production of maleic acid and maleic anhydride by catalytic oxidation of furfural in vapor phase at temperature of 270°C. improvement comprises performing oxidation in converting vessel interior of which is formed of nickel oxidizing furfural in contact with cured catalytic mix consisting of catalyst, catalyst promoter and catalyst carrier, etc. No. 2,421,428. Erik R. Nielsen to The Quaker Oats Company.

Purification and drying of methyl chloride containing methanol, hydrochloric acid and water. No. 2,421,441. Edgar Allen Thronson and Arthur Ignatius Mendolia to E. I. du Pont de Nemours & Company.

Continuously converting aldol to 1,3-butylene glycol. No. 2,421,451. Frederick R. Balcar to Air Reduction Company, Inc.

Production of low-boiling diolefin comprises passing low-boiling hydrocarbon mixture containing predominantly paraffin hydrocarbons of four to five carbon atoms per molecule to fractionating means separating therefrom low-boiling paraffinic fraction comprised of hydrocarbons of single carbon atom skeleton and containing from four to five carbon atoms in straight chain, etc. No. 2,421,506. Jean P. Jones to Phillips Petroleum Company.

Oxidation of high molecular weight alkyl mercaptan to disulfide by treatment with aqueous solution of cupric chloride. No. 2,421,545. Willie W. Crouch to Phillips Petroleum Company.

Producing isobutylene and acetaldehyde comprises contacting vapors of 2-methylpentane-2,4-diol, with dehydration catalyst comprising sodium dihydrogen phosphate on Activated Alumina at from 200°C to 500°C. No. 2,421,554. Harry de V. Finch and Seaver A. Ballard to Shell Development Company.

Making di-acetals of pyruvic aldehyde with monohydric alcohols comprises heating mixture of pyruvic aldehyde, monohydric alcohol, inert, water-immiscible organic liquid boiling below 100°C. and acid catalyst distilling water from mixture as reaction progresses at 50°C to 100°C recovering pure di-acetal of pyruvic aldehyde by fractional distillation. No. 2,421,559. Howard R. Guest, Louis G. MacDowell and Raymond W. McNamee to Carbide and Carbon Chemicals Corporation.

Unsaturated cyclic ethers. No. 2,421,597. Herman A. Bruson to The Resinous Products & Chemicals Company.

Continuously reducing aromatic nitro compounds comprises maintaining reaction zone containing plurality of spaced beds of catalyst consisting of molybdenum sulfide on charcoal, introducing into one of beds of catalyst in reaction zone, mixture of aromatic nitrocompounds, heavy oil diluent which is sufficiently high-boiling to remain in liquid state and hydrogen, etc. No. 2,421,608. Edwin J. Gohr to Standard Oil Development Company.

Production of material from group consisting of 2-keto gulonic acid and its calcium salt comprise inoculating aqueous nutrient medium comprising substance from group consisting of idonic acid and calcium idonate in presence of bacteria Pseudomonas mildenbergii, agitating and aerating solution. No. 2,421,611. Byron E. Gray.

Production of material from group consisting of 2-keto gulonic acid and its calcium salt comprises inoculating aqueous solution of calcium salt of gluonic acid with bacteria Acetobacter suboxydans, oxidatively fermenting inoculated solution. No. 2,421,612. Byron E. Gray.

Producing pyrroles and hydrogenated pyroles comprises passing stream of ammonia containing vaporous 1,4-dihydroxyalkyl compound of general formula described in patent, over catalyst selected, oxides, phosphates and borates of metals of third and fourth groups of Periodic Table at 200° to 400°C. No. 2,421,650. Walter Reppe, Curt Schuster and Emil Weiss to General Aniline & Film Corporation.

Preparation of polyorganohalogenopolysiloxanes. No. 2,421,653. Robert O. Sauer to General Electric Company.

Preparation of isoparaffins and reactivation of catalyst used therein. No. 2,421,674. George W. Ayers, Erskine E. Harton, and Lawrence M. Henderson to The Pure Oil Co.

Conversion of aliphatic hydrocarbons to aromatic hydrocarbons. No. 2,421,677. Arnold Belchetz to The M. W. Kellogg Company.

Mono-substituted dialkanol piperazines. No. 2,421,707. John David.

Dialkylaminoalkyl benzhydryl ethers and salts thereof. No. 2,421,714. George Rieveschl, Jr. to Parke, Davis & Company.

Forming 3-aryl-1:5-dihalopentane-3-carboxylic acid comprises reacting upon 4-aryl-tetrahydropyrane-4-nitrile with strong hydrohalogen acid. No. 2,421,729. Eric Walton and Maurice Berkeley Green to Burroughs Wellcome & Co. (U.S.A.) Inc.

Acetals of general formula described in patent. No. 2,421,770. Joseph E. Bludworth and Donald P. Easter to Celanese Corporation of America.

Producing chroman compounds comprises reacting gamma-gamma-dialkyl-substituted allylic alcohol having double bond in beta-gamma position to hydroxyl group with aromatic compound containing free hydroxyl group and unsubstituted position ortho to hydroxyl and selected from alkyl-substituted-para-di-hydroxy benzenes and their mono ethers and mono ester, reaction being carried out at superatmospheric pressure in presence of acid catalyst. No. 2,421,811. Lee Irvin Smith and Herbert E. Ungnade to Regents of the University of Minnesota.

Producing chromans which comprises reacting gamma-gamma-dialkyl-substituted allylic halide having double bond in beta-gamma position with aromatic compound containing free hydroxyl group and unsubstituted position ortho to hydroxyl group and selected from alkyl-substituted-para-di-hydroxy-benzenes, and their mono ethers and mono esters, in presence of acidic substance. No. 2,421,812. Lee Irvin Smith and Herbert E. Ungnade to Regents of the University of Minnesota.

Hydroxy-cyanoalkyl naphthalenes. No. 2,421,837. Albert F. Hardman to Wingfoot Corporation.

Improved process for obtaining large yields of polyhydric alcohol by reaction of cyclic formals with aliphatic alcohol, comprises heating cyclic formals with methyl alcohol in presence of acid reacting catalyst, removing methyal formed in reaction as vapor. No. 2,421,862. Erving Arundale and Louis A. Mikeska to Standard Oil Development Company.

Making triglycol dichloride comprises reacting ethylene, chlorine and water and adding to reaction mixture proportion of B,B' dichloroethyl ether equal to at least about 2% by weight of water. No. 2,421,903. Joseph C. Patrick to Thiokol Corp.

Ethers of 2-hydroxyl-3,5,x-trichlorodiphenyl. No. 2,421,924. Gerald H. Coleman and Wesley D. Schroeder to The Dow Chemical Company.

Producing olefin polymers of highly branched chain structures. No. 2,421,936. Vladimir Haensel and Vladimir N. Ipatieff to Universal Oil Products Company.

Producing hydrocarbons of higher molecular weight comprises polymerizing olefinic hydrocarbon in presence of boron trifluoride and fluorosulfonic acid. No. 2,421,946. Vladimir N. Ipatieff and Carl B. Linn to Universal Oil Products Company.

Polymerization process comprises reacting olefinic hydrocarbon in presence of catalyst comprising major proportion by weight of liquid hydrogen fluoride having disolved therein minor proportion by weight of inorganic compound soluble in liquid hydrogen fluoride. No. 2,421,950. Carl B. Linn to Universal Oil Products Company.

Conversion process comprises polymerizing olefinic hydrocarbon having at least 3 carbon atoms per molecule in presence of catlyst. No. 2,421,951. Carl B. Linn to Universal Oil Products Company.

Preparing 1-acyloxydiene-1,3 comprising condensing ketene with unsaturated aldehyde of general formula described in patent. No. 2,421,976. Albert H. Agett to Eastman Kodak Company.

Preparing sulfoalkyl ethers of cellulose comprises reacting upon cellulose with compound selected from ethionic acid, carbyl sulfate, and the salts of ethionic acid. No. 2,422,000. Joseph B. Dickey and James G. McNally to Eastman Kodak Company.

In preparing imines, step of reacting ketone with ammonia and hydrogen at between 50°C and 250°C at pressure of between 200 lbs. p.s.i. and 1,000 lbs. p.s.i. in presence of hydrogenation catalyst while maintaining in reaction mixture at least two mols of ketone per mol of ammonia present. No. 2,422,013. Vernon E. Haury and Seaver A. Ballard to Shell Development Company.

Preparing acetone and alkyl acetate comprises preparing mixture of isopropenyl acetate, alcohol of 1-5 carbon atoms and small proportion of esterification catalyst, subjecting mixture to elevated temperature. No. 2,422,016. David C. Hull and Albert H. Agett to Eastman Kodak Company.

Bicyclic compound containing a diphenylamine nucleus. No. 2,422,029. James G. McNally and Joseph B. Dickey to Eastman Kodak Company.

Improved method of making 2-amino-5-substituted 1,3,4-thiadiazoles in which 5-position substituent is radical selected from alkyl, alkenyl, aralkyl and cycloakyl radicals. No. 2,422,050. George W. Steahly to Monsanto Chemical Company.

Preparing chlorinated quinones from amino-substituted benzene and alpha-amino-substituted naphthalene compounds. No. 2,422,089. Harry H. Fletcher to United States Rubber Company.

Preparing purified organic sulphonates comprises flashing hot mixture containing organic sulphonyl halide, unsulphonated material, alkaline hydrolyzing agent and solvent therefor into zone maintained at temperature above boiling point of solvent. No. 2,422,128. Joseph Henry Percy to Colgate-Palmolive-Peet Company.

Producing plurality of aromatic compounds comprises heating paraffin having at least two carbon atoms and having two aryl substituents attached to one of carbon atoms at temperature which will cause paraffin to decompose into plurality of aromatic compounds in presence of catalyst and which is at least 350°C in presence of titania-alumina-silica catalyst. No. 2,422,163. James Kenneth Dixon to American Cyanamid Company.

N^4-carboxyacyl-N^1-(4-sulfamylphenyl)-sulfanilamide in which carboxyacyl group is monacyl radical of dicarboxylic acid selected from the aliphatic and aromatic dicarboxylic acids. No. 2,422,170. Maurice L. Moore to Sharp & Dohme, Inc.

Substance selected from class consisting of 2-methyl-3-hydroxy-4:5-epoxy-dimethylpyridine and hydrohalide salts thereof. No. 2,422,195. Stanton A. Harris to Merck & Co., Inc.

Preparing chlorinated quinones from phenolic derivatives of benzene and alpha-hydroxy-naphthalene compounds. No. 2,422,229. Harry H. Fletcher to United States Rubber Company.

Carboxylic acids vicinally substituted with two mercapto groups. No. 2,422,246. Wilbur Arthur Lazier, Albert A. Pavlic and William Jennings Peppel to E. I. du Pont de Nemours & Company.

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* *U. S. Patents from Vol. 599, Nos. 1, 2, 3, 4.*
Canadian from July 29 - August 19, 1947.

Converting one of dichlorobutenes 1,2-dichlorobutene-3 and 1,4-dichlorobutene-2 to other isomer consists in heating dichlorobutene at 120°C until boiling point of mixture has been changed, separating resulting mixture of dichlorobutenes. No. 2,422,252. Julian A. Otto to General Chemical Company.

Organic composition consisting of oil containing from 0.02% to 15% of product obtained by reacting from 1 to 3 molecular proportions of compound selected from aliphatic and alicyclic compounds containing unsaturated carbon-to-carbon linkage, at 20° to 140°C with 1 molecular proportion of sulfur halide, etc. No. 2,422,275. Carl Winning and Dilworth R. Rogers to Standard Oil Development Company.

Producing plurality of aromatic compounds comprises heating paraffin having at least two carbon atoms and having two aryl substituents attached to one of said carbon atoms at temperature which will cause paraffin to decompose into plurality of aromatic compounds in presence of catalyst and which is at least 350°C in presence of metal silicate which metal is in Group IV (a) of Mendeleeff's Periodic Table. No. 2,422,318. Murray Gray Sturrock and Thomas Lawe to Dominion Tar & Chemical Company.

Reacting cephalin-containing vegetable phosphatide with 2-nitrobutanol-1 at 130°C to 170°C recovering acetone soluble reaction product. No. 2,422,321. Edward Trueger and Basil Sheldon Sprague to American Lecithin Company.

Separation of mixture of hydrocarbon compounds of different degrees of saturation comprises contacting mixture with liquid alkyl mercaptal. No. 2,422,341. Willie W. Crouch to Phillips Petroleum Company.

Conversion of liquid normal butane to isobutane. No. 2,422,346. Gerald L. Farrar to Socony-Vacuum Oil Company, Inc.

Improved process for reacting by catalytic alkylation butylenes and isobutane contained in an olefin-containing C_4 hydrocarbon mixture to product paraffins of higher molecular weight. No. 2,422,349. Frederick E. Frey to Phillips Petroleum Company.

Resinous interesterification product made with hydroxylated fatty oil. No. 2,422,356. Edward A. Lasher to California Flaxseed Products Company.

Producing ethylene-vinyl chloride polymers. No. 2,422,392. Merlin Martin Brubaker, John Richard Roland and Merlin Dewey Peterson to E. I. du Pont de Nemours & Company.

Obtaining N-methylamides comprises reacting carbonamide compound selected from N-methylol and N-alkoxy methylamides with hydrogen in presence of active metal hydrogenation catalyst at 50°C to 150°C under superatmospheric pressure above 100 pounds p.s.i. No. 2,422,400. Mark Wendell Farlow to E. I. du Pont de Nemours & Company.

Production of cycloalkene oxides comprises dehydrating cycloalkanediol by action of metal oxide dehydrating catalyst at 150°C to 400°C correlating reaction temperature and time with catalyst activity to effect dehydration of substantial portion of cycloalkanediol to corresponding cycloalkene oxide. No. 2,422,435. Herman Pines and Vladimir N. Ipatieff and Ralph C. Olberg to Universal Oil Products Company.

Extracting glycerol from liquid concentrated carbohydrate fermentation still residue having non-acid reaction. No. 2,422,453. Robert Alan Walmesley to Imperial Chemical Industries, Limited.

Electroyltic production of pinacols. No. 2,422,468. Thomas S. Chambers and Ober C. Slotterbeck to Standard Oil Development Company.

Xylidine stabilized against discoloration during storage by having added thereto 0.2% of parathiocresol. No. 2,422,484. Walter A. Herbst to Standard Oil Development Company.

Continuous process of simultaneously producing toluene and xylidine comprises charging naphthenic naphtha containing between 60 and 70% of naphthenes including methyl cyclohexane to reforming zone together with hydrogen and nitroxylene, etc. No. 2,422,485. Ralph M. Hill to Standard Oil Development Company.

Composition consisting of 24 parts by weight of condensation product of sorbitan mono stearate and ethylene oxide in molar ratio of 1:4 and 6 parts by weight of condensation product of sorbitan mono stearate and ethylene oxide in molar ratio of 1:20 emulsified in water. No. 2,422,486. Norman F. Johnston to R. T. Vanderbilt Company, Inc.

Composition comprising alkaryl amine and small but stabilizing amount of boric acid. No. 2,422,503. Robert K. Smith to Standard Oil Development Company.

Recovering lower fatty acids from dilute aqueous solution. No. 2,422,504. Oswald Spence to Masonite Corporation.

Tetrachlor succinonitrile and process of producing. No. 2,422,528. Oliver W. Cass and Harry B. Copelin to E. I du Pont de Nemours & Company.

N-(2-hydroxyl-ethyl)-ethylenediamine disalt of 2.6-dinitro-4-cyclohexylphenol. No. 2,422,544. John N. Hansen, Albert Lea and Frank B. Smith to The Dow Chemical Company.

Reaction product of alkyleneimine with ammonium dithiocarbamate. No. 2,422,578. Roger A. Mathes to The B. F. Goodrich Company.

Compounds containing active methylene group and process of preparing. No. 2,422,598. Eric T. Stiller to Merck & Co., Inc.

Normal, secondary, tridecyl sulphate. No. 2,422,613. Emil E. Dreger and John Ross to Colgate-Palmolive-Peet Company.

Production of chromanes, step comprising heating 1-gamma-keto-butyl-trimethyl-benzo-hydroquinone with alkyl magnesium halogenide. No. 2,422,625. Walter John.

Manufacturing aliphatic amines comprises mixing together olefin, oxide of carbon, hydrogen and aminating agent chosen from class consisting of ammonia and primary and secondary amines, passing mixture over heated hydrogenation-dehydration catalyst to form desired amine. No. 2,422,631. John F. Olin and Thomas E. Deger to Sharples Chemicals, Inc.

Manufacturing aliphatic amides comprises mixing together olefin, carbon monoxide and aminating agent chosen from class consisting of ammonia and primary and secondary amines passing resulting mixture over heated dehydration catalyst to form desired amide. No. 2,422,632. John F Olin and Thomas E. Deger to Sharples Chemicals, Inc.

Pyrimidine compounds. No. 2,422,890. Francis Henry Swinden Curd and Francis Leslie Rose to Imperial Chemical Industries, Limited.

Manufacture of valuable steroid hydroxy ketones which are twofold unsaturated in ring A, step comprises heating androstanol-17-one-3 dihalogenated in ring A with collidine until halogen hydridge is split off. No. 2,422,904. Hans Herloff Inhoffen and Gerhard Zuhlsdorff to Schering Corporation.

Manufacture of chloropolythene comprises dissolving polythene in boiling carbon tetrachloride. No. 2,422,919. James Robertson Myles and Philip James Garner to Imperial Chemical Industries, Limited.

Making higher alkyl aromatic hydrocarbon substituted products comprises chlorinating mineral hydrocarbon wax having melting point of not less than 30°C to degree of chlorination corresponding to 190 to 390 mol per cent chlorination, condensing resultant chlorinated wax with aromatic hydrocarbon, sulfonating resultant condensation product. No. 2,422,926. Howard F. Reeves, Jr., to Wyandotte Chemical Corporation.

1-bromo-4-(N-alkylamino)-hexanes represented by formula described in patent. No. 2,422,957. Robert C. Elderfield and James D. Head.

Production of isoparaffins from olefins. No. 2,422,991. Leslie Christopher Strang to Anglo-Iranian Oil Company, Limited.

Making secondary polyhydroxyalkylaryl amine. No. 2,422,997. Heinz Moritz Wuest to Hoffmann-La Roche, Inc.

Di(aryl sulfene) amides as co-accelerators. No. 2,423,007. Ralph A. Coleman to United States Rubber Company.

Alkamine esters of diarylpropionic acids. No. 2,423,025. Roger B. Holmes and Arthur J. Hill to American Cyanamid Company.

Dehydrogenation of paraffinic and olefinic hydrocarbons to produce corresponding olefins and diolefins. No. 2,423,029. Eugene J. Houdry to Houdry Process Corporation.

Polymerizable mixed ester of unsaturated alpha beta polycarboxylic acid and 0.05 to 0.35 mole of phthalic acid 0.5 to 1.5 moles of ethylene glycol per mole of unsaturated acid. No. 2,423,042. Irving E. Muskat to Marco Chemcials, Inc.

Aryl polymercury naphthenates and their production. No. 2,423,044. Milton Nowak to Nuodox Products Co., Inc.

Resolution of di-alpha-hydroxy-beta:beta-dimethyl-gamma-butyrolactone. No. 2,423,062. Franz Berge, Aaron Cohen, Alexander Lang Morrison and Albert Ronald Moss to Hoffmann-La Roche, Inc.

Preparing alicyclic guanamine comprises dissolving biguanide and ester of alicyclic carboxylic acid in common solvent whereby reaction and precipitation of resultant guanamine is instituted, continuing reaction until precipitation ceases, collecting resultant guanamine. No. 2,423,071. Jack Theo Thurston to American Cyanamid Company.

Canadian

Production of acyclic condensation products of acetylene. No. 443,238. Distillers Company, Ltd. (Hans Peter Staudnger, Karl Heinrich Walter Tuerck).

Resin of the vinyl halide type and a plasticizer therefor consisting of di-isobutyl adipate. No. 443,263. The Glenn L. Martin Company (Earl Harry Sorg).

Production of non-yellow trauslucent molded articles made of a urea-formaldehyde resin, cellulose pulp and about 1.26 per cent of titanium dioxide based on the weight of the cellulose pulp. No. 443,399. American Cyanamid Company (Charles R. Stock).

Compounds of the group consisting of 2-thio-4,6-diamino-1,3,5-thiadiazine, its tautomers, and the acid salts of such compounds. No. 443,400. American Cyanamid Company (Donald W. Kaiser and Russell L. Sperry).

An ester of monohydric aliphatic nitro-alcohol with an aliphatic alpha, beta-ethylenically unsaturated carboxylic acid, said ester having not more than twelve carbon atoms. No. 443,411. Canadian Industries, Ltd. (Courtland Le Verne Agre and Robert Mitchell Leekley).

Process which comprises simultaneously polymerizing 1,3-dioxolane with ethylene oxide, in the presence of an acidic polymerization catalyst. No. 443,415. Canadian Industries, Ltd. (William Franklin Gresham).

Manufacture of tetrahydrofuran by contacting tetrahydrofurfuryl alcohol in the vapour phase with a nickel catalyst at 200°C, 300°C, and at pressures not in excess of atmospheric in the absence of added hydrogen. No. 443,416. Canadian Industries, Ltd. (Christopher Lumley Wilson).

Resinous reaction product of polyhydric alcohols and alpha-methylene aldehydes. No. 443,419. Canadian Industries, Ltd. (Henry Shirley Rothrock).

Synthetic linear polyamide of improved durability on exposure to sunlight. No. 443,420. Canadian Industries, Ltd. (Donald Drake Coffman and Halsey Bidwell Stevenson).

Process for preparing 2-methyl-4-keto-1, 3-dioxolane. No. 443,428. Canadian Industries, Ltd. (Rollin Francis Conaway).

Production of fluoroacetamides reacting a polyfluoroethylene and an organic amine containing amino-hydrogen with admixture of water. No. 443,430. Canadian Industries, Ltd. (George Wayne Rigby and Herman Elbert Schroeder).

Process for making N-alkoxymethyl polyamides. No. 443,433. Canadian Industries, Ltd. (Arthur Whitney Larchar).

Process for condensing an a, B unsaturated nitrile with a nitro-substituted aliphatic compound. No. 443,713. American Cyanamid Co. (Jack T. Thurston).

Oxidizing dimethyl dithiocarbamic acid to tetra methyl thiuram disulphide by introducing gaseous chlorine into the atmosphere above the surface of an aqueous solution of a water soluble salt of the dithiocarbamic acid. No. 443,752. Monsanto Chemical Co. (Robert Harris Cooper).

Process for the production of oxygen-containing organic compounds from olefins. No. 443,785. Claude George Bonard (Walter Henry Groombridge and Ronald Page).

**Packaging*

Compressed gas container. No. 2,421,460. Herman Merker and John L. Graham to Pressed Steel Tank Company.

**Paints, Pigments*

As varnish base, product resulting from cooking at varnish-cooking temperatures at and above 240°C. (1) varnish base mixture, (2) mixture of rosin and rosin; hydrocarbons constituting from 5% to 20% of amount of varnish oil present. No. 2,422,175. Laszlo Auer to Ridbo Laboratories, Inc.

**Paper, Pulp*

In manufacture of sulphite cellulose method of washing sulphite waste liquor from sulphite pulp comprises displacing sulphite waste liquor from pulp by addition of distillery slop obtained as dregs from distillation of alcohol from fermented sulphite waste liquor. No. 2,421,590. Johan Astrom to Svenska Cellulosa Aktiebolaget.

Clarifying wood liquors for fermentation, comprises subjecting liquor to acid hydrolysis, washing liquor with water-immiscible organic solvent containing compound chosen from butyl alcohol, furfural and isopropyl ether, heating liquor to remove excess organic solvent, introducing calcium ions and sulfide ions into liquor to raise pH to 7 which precipitates astringent materials toxic to fermentation. No. 2,421,985. Robert M. Boehm, Horace E. Hall and Joseph A. MacDonald to Masonite Corporation.

Improving dimensional stability of cardboard paper products. No. 2,422,423. Hamline M. Kvalnes to E. I. du Pont de Nemours & Company.

Defibrating cellulosic material comprises maintaining at temperature above 212°F and at superatmospheric pressure ever-changing confined body of vapor, defibrating such material within vapor body, etc. No. 2,422,522. James Brookes Beveridge and Richard D. Kehoe to Paper and Industrial Appliances, Inc.

**Petroleum*

Separator for crude oil. No. 2,421,375. Peter Mather Elliott to Oil Distribution Appliances, Limited.

** U. S. Patents from Vol. 599, Nos. 1, 2, 3, 4. Canadian from July 29 - August 19, 1947.*

Apparatus for treating depleted oil sands for increasing oil flow therefrom. No. 2,421,528. Ralph M. Steffen.

Lubricant of class consisting of oils and greases and small amount sufficient to impart extreme pressure properties to said lubricant of finely divided non-crystalline metallic sulfide dispersed therein. No. 2,421,543. James F. Cook to Union Oil Company of California.

Producing aviation gasoline blending stock comprises catalytically cracking relatively high boiling hydrocarbon fraction at 900°F to 1000°F to produce lower boiling constituents containing aromatic constituents and paraffins, etc. No. 2,421,614. Homer J. Hall to Standard Oil Development Company.

Lubricant comprising in combination major proportion of oil of lubricating viscosity and minor proportion sufficient to stabilize oil against oxidation of salt of sulfurized relatively high molecular weight of carboxylic acid carboxylic acid being unsaturated and being sulfurized by reaction with sodium pentasulfide. No. 2,421,631. Bert H. Lincoln and Gordon D. Byrkit.

Lubricating emulsion comprising emulsion of mineral oil-in-water, guanidine salt of soap-forming saturated fatty acid, an alkylolamine salt of aliphatic monocarboxylic acid containing at least 10 carbon atoms, alkylolamine salt being present in amounts to stabilize emulsion at elevated temperatures. No. 2,422,075. Malcolm D. Bray to The Texas Company.

Resolving petroleum emulsions of water-in-oil type by subjecting emulsions to action of demulsifying agent comprising sub-resinous esterified adduct. No. 2,422,177. Charles M. Blair, Jr., to Petrolite Corporation, Ltd.

Lubricating composition comprising major proportion of mineral lubricating oil and amount sufficient to impart extreme pressure properties of compound represented by formula described in patent. No. 2,422,243. Amos T. Knutson and Eldon F. Graves to The Lubri-Zol Corporation.

Lubricants, etc., containing waxy hydrocarbons and a ketone-aromatic condensation product as wax modifier. No. 2,422,247. Eugene Lieber and Aloysius F. Cashman to Standard Oil Development Company.

Lubricant comprising in combination hydrocarbon oil and dissolved viscosity index improving amount of reaction product of polymerized methyl pentadiene having molecular weight within range between 8,000 and 25,000 in combination with maleic anhydride. No. 2,422,278. David W. Young and John D. Calfee to Standard Oil Development Company.

Improved method of chemically condensing petroleum hydrocarbons of relatively small complexity into hydrocarbons of greater complexity. No. 2,422,443. William Alvah Smith.

Non-clogging fuel oil composition comprising normally liquid hydrocarbon fuel normally susceptible to cause clogging containing in combination therewith from 0.01% to 0.1% of oil-soluble polyvalent metal soap and from 0.005% to 0.05% of condensation product selected from class consisting of reaction product of polyalkylene compound with carbonyl compound. No. 2,422,566. Wayne A. Proell to Standard Oil Company.

Oleaginous composition comprising major proportion of hydrocarbon oil and in combination therewith from 0.01% to 5% by weight of sulfurized terpene and from 0.001% to 10% by weight of neutralized reaction product of phosphorus sulfide and hydrocarbon. No. 2,422,585. Thomas H. Rogers, Roger W. Watson and James W. Starrett to Standard Oil Company.

*Photographic

Photographic element comprising silver halide photographic emulsion containing as color forming development component imidazolone of formula described in patent. No. 2,421,693. Benjamin Ramage Harriman to General Aniline & Film Corporation.

Photographic emulsions containing supersensitizing dye combinations. No. 2,422,080. Ronald Bernard Collins and Harold Owen Dickinson to Ilford, Limited.

*Polymers

Preparing thermoset polymer comprises mixing copolymer prepared from 75 to 90% by weight of vinyl chloride and 25 to 10% of vinylidene chloride with from 1 to 10% of aliphatic amine made up of only carbon, hydrogen and amino nitrogen atoms and from 2 to 10% of heat-hardenable resin prepared by condensation of one of phenols with one aldehydes, subjecting copolymer to heat until there is obtained polymeric material having tensile strength at least 50% greater than that of uncured stock. No. 2,421,852. Thomas H. Rogers, Jr., and Robert D. Vickers to Wingfoot Corporation.

Preparing hard, resinous copolymer product comprises heating mixture of 50 to 80% of styrene and 20 to 50% of ester of endomethylene tetrahydrophthalic acid and glycol consisting of 2 to 4 ethylene groups between hydroxyls, ethylene groups being bridged together by ether-oxygen linkages, heating operation at 60 to 100°C in presence of peroxide type catalyst. No. 2,421,876. Howard L. Gerhart to Pittsburgh Plate Glass Company.

Hydrolyzed interpolymer of terminally ethylenically unsaturated monoolefinic hydrocarbon containing from 3 to 5 carbon atoms with vinyl ester of mono-carboxylic acid having general formula RCOOH, etc. No. 2,421,971. Carleton Angelo Sperati to E. I. du Pont de Nemours & Company.

Ebonite cured composition comprising reaction product of copolymer of butadiene and styrene, sulfur in amount to vulcanize copolymer to ebonite state, fatty acid, boric oxide in amount from 0.1 to 15% by weight of copolymer, and non-reactive filler in proportion by volume with respect to copolymer of from 1:1 to 4.1:1. No. 2,422,153. Garret Van Nimwegen, Carl von Doenhoff and Charles E. Wooddell to The Carborundum Company.

Process comprises heating at 275° to 280°C mixture consisting of alkali refined linseed oil and low-viscosity, low-hydroxyl polyvinyl butyral in amount of from 25% to 75% of mixture. No. 2,422,259. Burt Carlton Pratt to E. I. du Pont de Nemours & Company.

Process for obtaining tough, durable high molecular weight polymeric products comprises incorporating catalyst and resinous condensation product or urea-formaldehyde and monohydric alcohol with thermoplastic, organic solvent soluble, rubbery and millable reaction product of linear polymeric polycarboxylic ester carbon amide. No. 2,422,271. Gordon T. Vaala and Charles E. Frank to E. I. du Pont de Nemours & Company.

Rubber-like copolymer obtained by copolymerization of mixture containing from two to fifteen molecular proportions of conjugated butadiene hydrocarbon to one molecular proportion of alkyl ester of methacrylic acid which contains from two to five carbon atoms in alkyl radical. No. 2,422,371. Frank K. Schoenfeld to The B. F. Goodrich Company.

Canadian

Polymeric hydroxamic acid. No. 443,429. Canadian Industries Ltd. (Donald Drake Coffman).

Solid, macromolecular, partially hydrolyzed interpolymer of ethylene with a vinyl ester of an organic monocarboxylic acid. No. 443,437. Canadian Industries, Ltd. (John Richard Roland).

*Processes and Methods

Preparing basic lead salicylate selected from pentabasic lead salicylate, monobasic lead salicylate, and mixtures thereof. No. 2,421,706. Leonard M. Kebrich to National Lead Company.

Cleaning metal articles consists of projecting there against stream of fluid under pressure carrying in suspension pelletized nut shells having hardness of black walnut shells. No. 2,421,806. Frank R. Perry to Turco Products, Inc.

In treating tall oil, step of esterifying oil with at least one polyhydric alcohol in presence of at least one siliceous catalyst. No. 2,421,842. Frederick Charles Martin.

Forming a uniform and smooth solution of cellulose triacetate in mixture of methyl alcohol and dichloromethane which is good solvent for cellulose triacetate, comprises preliminarily baking cellulose triacetate at 212°F to 220°F for 1 to 2 hours, immediately incorporating cellulose triacetate with solvent mixture. No. 2,421,897. John D. McCaleb and Joseph J. Reis, Jr. to Pittsburgh Plate Glass Company.

Purifying copal comprising grinding copal to pass 20 mesh screen; mixing reduced copal with about one sixteenth its weight of plasticizer to form mix, spreading mix in thin layer upon screen; quickly heating layer to melt fusible portions of copal; wiping layer to force fused portions through screen and rake off foreign matter, etc. No. 2,421,952. Samuel Lipsius.

Permanently removing surface imperfections from articles of cellulose acetate comprises softening surfaces of articles by treatment with solvent mixture. No. 2,422,017. Richard H. Hunt, Jr. to Monsanto Chemical Company.

In production of vulcanized esters of unsaturated fatty acids, method comprises, vulcanizing ester selected from esters of fatty acids having more than one double bond in fatty acid chain, and esters of hydroxylated fatty acids, vulcanization being effected with sulphur at 120°C to 200°C, etc. No. 2,422,049. Paul Stamberger.

Demineralizing aqueous solution of electrolytes comprises passing predetermined substantial volume of solution successively through cation exchange material and acid removal material, then collecting volume in separate receptacle, etc. No. 2,422,054. Howard L. Tiger to The Permutit Company.

Catalytic dehydrogenation of dehydrogenatable hydrocarbon wherein catalyst is periodically regenerated by burning deposited carbonaceous materials therefrom. No. 2,422,172. Albert E. Smith and Otto A. Beeck to Shell Development Company.

Apparatus for raising disassociation pressure of acetylene in generators. No. 2,422,225. John J. Crowe to Air Reduction Company.

Manufacturing leather-like sheets of dehydrated citrus fruit paste containing substantially all ingredients of fresh fruit except bulk of ethereal oils. No. 2,422,588. Zdenka Samisch.

Treating asbestos, comprises eliminating from asbestos masses longest and shortest fibers whereby average fiber length of masses is in range from 5/8 inch to 7/8 inch. No. 2,422,980. Lee Collin Pharo to Johnson's Company.

Treatment of wood for removal of pitch comprises subjecting wood to dissolving action of water and acetone to dissolve pitch, segregating pitch from water-acetone solution by action of carbon tetrachloride in amount of 5% to 20% by volume of acetone. No. 2,423,020. Joye C. Haun to Electric Steel Foundry.

Carrying out liquid phase catalytic hydrocarbon reactions involving use of aluminum halide catalyst. No. 2,423,045. Herbert J. Passino and John S. Rearick to The M. W. Kellogg Company.

Canadian

Producing a resinous composition by adding precipitated gelatinous hydrous metal oxide particles containing adsorbed water to a wet phenol-aldehyde resin, and dehydrating. No. 443,228. Carbide and Carbon Chemicals, Ltd. (Clinton Rector and Conrad F. Schrimpe).

Process of producing a predeterminedly oriented section of a single crystal. No. 443,270 & 443,271. Polaroid Corp. (Cutler Delong West and Frederick Joseph Binda).

Method of dissolving cellulose triacetate in acetone. No. 443,320. Western Electric Company (William Oliver Baker).

Preparation of bubble-free solid bodies from polymerizable syrups. No. 443,422. Canadian Industries, Ltd. (Daniel Harper Beaton).

Improving the water resistance of shaped articles of polyvinyl alcohol. No. 443,431. Canadian Industries, Ltd. (Robert Albert Scheiderbauer).

*Rubber

Vulcanizing rubber and sulfur-vulcanizable rubber-like materials in presence of sulfur and powdered resinous fusion product of approximately 1 mol of zinc chloride 1 to 2 mols of monoarylguanidine, 2 to 8 mols of paraformaldehyde and 2 to 8 mols of mercaptobenzothiazole. No. 2,421,544. Elmer W. Cook and Edwin O. Hook to American Cyanamid Company.

Production of gas expanded rubber comprises incorporating in vulcanizable rubber mix vulcanization accelerator and blowing agent which on heating will form gas. No. 2,421,831. Alfred Cooper to Rubatex Products, Inc.

Vulcanization of rubberlike butadiene-1,3 polymerizates with phenol sulfides. No. 2,422,156. George M. Wolf, and Thomas E. Deger to Sharples Chemicals Inc.

Copolymerization of natural rubber with polymerizable monoethylenically-unsaturated compound. No. 2,422,550. Ralph A. Jacobson to E. I. du Pont de Nemours & Company.

Obtaining synthetic rubber of improved milling characteristics comprises incorporating sorbic acid with butadiene-1,3/styrene synthetic rubber wherein weight ratio of butadiene to styrene is between 60/40 to 75/25 acid being present in amount within range of 1% to 5% of weight of synthetic rubber. No. 2,422,932. Herman E. Schroeder and Charles J. Mighton to E. I. du Pont de Nemours & Company.

Reclaiming vulcanized rubbery polymer selected from choroprene polymers and butadiene, 13 polymers and mictures thereof comprising subjecting mixture of vulcanized rubbery polymer with monoamino compound which is ammonia having at least one hydrogen thereof replaced by monovalent hydrocarbon radical to live steam. No. 2,423,032. Ree Vilma le Beau to Midwest Rubber Reclaiming Company.

Canadian

Co-polymeric material, rubber-like in character, comprising a co-polymer of butadiene 1,3 and upwards of about 30 per cent by weight of 2,5-dichlorostyrene. No. 443,663. The Mathieson Alkali Works (John C. Michalek)

Bonding of viscose rayon filaments to rubber. No. 443,732. Courtaulds Ltd. (Donald Entwistle).

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*Specialties

Adhesive or cement for joining optical elements being transparent highly adherent to glass and consisting of from 85 to 99% of Canada balsam mixed with one to 15 per cent of ethyl cellulose. No. 2,421,436. John T. Rooney to American Optical Company.

Signal flare magazine and caster. No. 2,421,491. John A. Gearon and Edward Gearon.

Insecticidal composition comprising pyrethrum and 3,4-methylenedioxy-benzyl n-propyl ether as synergist therefor. No. 2,421,569. Frederick B. La Forge and William F. Barthel.

Insecticidal composition comprising pyrethrum and alpha-(3,4-methylene-dioxyphenyl)-tetrahydropyran as synergist therefor. No. 2,421,570. Frederick B. La Forge.

Abrasive article comprising abrasive grains bonded as integral porous body by vitrified ceramic material and two-phase filler comprising saturated aliphatic straight chain polymer containing chlorine which is suspended in and held in place within the pores by means of solid resin matrix. No. 2,421,623. Samuel S. Kistler to Norton Company.

Insulating tape permanently sticky at room temperature comprising body impregnated with polymerized alpha methyl styrene having viscosity between 10^3 and 10^6 poises at 20°C. No. 2,421,640. Archibald Alan New, Stanley George Foord and Dudley Robert Beckwith to International Standard Electric Corporation.

Anti-rust composition comprising between 5% and 95% by weight of oil-soluble metal soap of semi-drying oil and between 3% and 85% by weight of oil-soluble metal soap of synthetic organic acids produced by liquid phase oxidation of petroleum hydrocarbon. No. 2,421,672. Chester E. Wilson and Mary Louise Dodge to Union Oil Company of California.

Detergent paste comprising from 22% to 33% trisodium phosphate cal-culated as anhydrous salt trisodium phosphate being in solid, finely divided uniformly dispersed form, devoid of harsh abrasive properties, surface-active material capable of solubilizing alkali-earth metal compounds under detergent conditions and chosen from sulfonated and sulfated non-soap detergents, emulsifying agent chosen from salts of a liphatic acids, etc. No. 2,421,703. Jonas Kamlet to Boyle-Midway Inc.

Molded fiber-cement composition product. No. 2,421,721. Fred Wilson Smith, Harold W. Greider and Lloyd K. Becker to The Philip Carey Manufacturing Company.

Composition comprising clear, stable solution of quantity of essential oil and at least an equal quantity of water-soluble hydroxy polyoxyethylene ether of partial higher fatty acid ester of low molecular weight polyhydroxylic compound, said solution being capable, upon dilution with water, of forming clear, stable aqueous dispersion of essential oil and hydroxy polyoxyethylene ether. No. 2,422,145. Walter A. Taylor to Atlas Powder Company.

Adhesive composition of matter comprising adhesive selected from water soluble animal and vegetable adhesives and glucoside of glucose and primary alcohol containing from two up to eight carbon atoms. No. 2,422,328. Harland H. Young to Industrial Patents Corporation.

Continuous method of making hydraulic cement products. No. 2,422,345. Gustfve L. Easterberg and Roger A. MacArthur to The Philip Carey Manufacturing Company.

Composition of matter comprising water soluble alginate, fluosilicate, water soluble phosphate filler, lead silicate and calcium sulphate. No. 2,422,497. Stanley E. Noyes.

Solvent adapted for degreasing iron and aluminum comprising trichlor-ethylene containing as stabilizer against condensation reactions of trichlorethylene catalyzed by aforesaid metals, 0.02 to 1% by weight of vinyl cyanide. No. 2,422,556. Walter Klabunde to E. I. du Pont de Nemours & Company.

Canadian

Abrasive article having a hardened binder comprising the additive reac-tion product of diethylene glycol fumarate and a vinyl compound. No. 443,230. The Carbonundum Company (Norman Pierce Robie).

Waterproofing reagent for concrete mix comprising ammonium stearate and a lignosulphonic acid salt of ammonium. No. 443,305. G. F. Sterne and Sons, Ltd. (Cecil H. Wastle)

Coated abrasive article bonded by the polymerized diallyl succinate. No. 443,641. The Corborundum Co. (Norman Pierce Robie).

*Textiles

Device for testing static accumulating properties of textile fibers. No. 2,421,430. Ralph V. Ott to Celanese Corporation of America.

Apparatus for weaving fabrics of plastic materials. No. 2,421,532. Edward Welti to Hafner Associates, Inc.

Processing regenerated cellulose artificial silk thread. No. 2,421,624. Hayden B. Kline and Kenneth M. McLellan to Industrial Rayon Corporation.

In forming viscose thread, step comprises extruding viscose though spin-neret into coagulating liquid in presence of water-soluble, surface active polyoxyalkylene glycol polymer having molecular weight not substantially below 2000 and anion-active substance. No. 2,422,021. Hayden B. Kline, Alden H. Burkholder and William O. Israel to Industrial Rayon Corporation.

Improving tensile strength of naturally-occurring cellulosic fibers com-prises briefly treating yarns or cords thereof having substantially their natural composition and structure, with aqueous solution comprising alkali-metal salt of acids of "run" native congo copal resin. No. 2,422,078. Howard M. Buckwalter to United States Rubber Company.

Finishing textile material comprises applying thereto dispersion in aqueous caustic alkali solution of degraded cellulose derivative which is partially soluble in such caustic alkali solution, but insoluble in water and in aqueos alcohol, etc. No. 2,422,572. Leon Lilienfeld to Lilienfeld Patents, Inc.

Treating textile material comprises mixing with caustic alkali solution xanthate of degraded cellulose ether, which ether in unxanthated state is insoluble in water but which is partially soluble in dilute caustic alkali solution, etc. No. 2,422,573. Leon Lilienfeld to Lilienfeld Patents, Inc.

Dyeing basic nitrogenous fibers with metallized acid monoazo dyes con-taining amino group and hydroxy group ortho to azo group. No. 2,422,586. George Lewis Royer and Chester Albert Amick to American Cyanamid Company.

Producing alginate threads free from stuck filaments comprises extruding solution of sodium alginate through multihole jet into coagulating bath consisting of water, 5% of calcium chloride, from 0.01% to 0.10% of cetyl pyridinum chloride from 0.1% to 5% of acetic acid collecting threads formed in centrifugal spinning box. No. 2,422,993. Ernest Edward Tallis to Courtaulds Limited.

Producing alginate threads free from stuck filaments while using thread advancing helices. No. 2,423,075. Ronald Bertram Hall to Courtaulds Limited.

Canadian

Fibre-forming interpolyamide melting above 220°C which has a receptivity for acid dyes greater than that of polyhexamethylene adipamide. No. 443,423. Canadian Industries Ltd. (Elmore Louis Martin).

Process for preparing from polyamide an insolubilized infusible shaped article. No. 443,424. Canadian Industries Ltd. (Theodore Lesueur Cairns).

Polyamide comprising the reaction product of a linear polymer-forming composition consisting of a mixture of 4-mercaptopimelic acid and diamine. No. 443,427. Canadian Industries, Ltd. (Elmore Louis Martin).

Process of producing wool-like artificial silk yarns of regenerated cellulose. No. 443,652. Heberlein Patent Corp. (Georges Heberlein).

Biochemical

Production of penicillin comprising preparing aqueous nutrient medium, adjusting nutrient medium to pH lying within range 4.6 to 8.0, inoculating nutrient medium with penicillin-producing mold, adding to nutrient medium from 0.005 to 0.50 gram of member selected from phenylacetic acid, salts of phenylacetic acid, and esters of phenylacetic acid per 100 ml. of nutrient medium. No. 2,423,873. Robert D. Coghill and Andrew J. Moyer.

Cellulose

Production of cellulose derivatives comprises esterifying cellulose ethers at temperatures up to 50°C with anhydrides of organic carboxylic acids containing at least six carbon atoms in molecule in presence of metal halides and hydrogen halide as catalysts No. 2,423,883. James Wotherspoon Fisher to British Celanese, Limited.

*Ceramics

Glass resulting from the fusing together of parts by weight, P_2O_5 70, SiO_2 5, Al_2O_3 13, B_2O_3 5, CaO 7 containing suitable reducing agent. No. 2,423,128. Edgar D. Tillyer to American Optical Company.

Manufacturing compositions useful, as mill addition opacifier agents in production of vitreous or porcelain enamels. No. 2,423,212. Virgil H. Waite and Harry Burnham Allport to The McGean Chemical Company.

Refractory cement consisting of mixture of kaolin and potassium silicate. No. 2,423,231. Robert Esnault-Pelterie to AGEV Aktiengesellschaft fur Erfindungsverwertung.

Making abrasive grinding wheels of vitrified bonded type having central bushing. No. 2,423,293. August C. Ciell.

Producing dry catalytic pellets of acid-treated montmorillonite clay. No. 2,423,309. Wright W. Gary to Filtrol Corporation.

Siliceous contact material comprising spherular granules of aggregated calcined particles of diatomaceous earth impregnated with active catalyst. No. 2,423,686. Arthur B. Cummins to Johns-Manville Corporation.

Making molded basic magnesium carbonate compositions by carbonating slurry of magnesium compound selected from magnesium hydroxide, etc. No. 2,423,839. Alan R. McGarvey and Conral C. Callis to Armstrong Cork Company.

Making molded basic magnesium carbonate compositions, etc. No. 2,423,840. Alan R. McGarvey and Conral C. Callis to Armstrong Cork Company.

Making molded basic magnesium carbonate compositions, etc. No. 2,423,841. Alan R. McGarvey and Conral C. Callis to Armstrong Cork Company.

Batch for production of ceramic body composed predominately of alumina and containing tri-calcium penta-aluminate and silica. No. 2,423,958. Chester R. Austin and Edwin J. Rogers to United Aircraft Corporation, and Ethyl Corporation.

White opaque glaze having composition within range expressed by Seger formula described in patent. No. 2,423,971. Lewis D. Gittings to Monsanto Chemical Company.

Heat cast refractory composed of indigenous crystals in amorphous matric and containing 45% to 92% alumina, 1.9% to 40% zirconia, 1.5% to 5% silica, 1.4% to 7% magnesia, 0% to 3% alkali metal oxide, 0% to 3% iron oxide and 0% to 5% titania. No. 2,424,082. Theodre Estes Field to Corhart Refractories Company.

Moldable compositions consisting by weight of at least 70% of refractory titanium compound, remainder being mixture of clay and fluoride chosen from alkaline earth fluorides and lead fluoride. No. 2,424,111. Louis Navias and Robert L. Green to General Electric Company.

Forming glass film on metallic member having plane surface. No. 2,424,353. Sanford F. Essig to Farnsworth Television and Radio Corporation.

Canadian

Light-weight composition having water-proofed exfoliated-vermiculite and a binder for said vermiculite. No. 444,096. Universal Zonolite Insulation Co. (Robert R. Goodrich and Glenn Susetti).

Coatings

Producing improved coated and impregnated material comprising impreg-nating materials with aqueous solution at 50°C of water-soluble salt of basic aminealdehyde type resin, etc. No. 2,423,185. Wolfgang Gundel and Ernst Gotte to The Hydronapthene Corporation.

Structure comprising base solid, resin body attached thereto and adhesive film therebetween comprising cyclicized polymethylpentadiene. No. 2,423,755. John D. Calfee and David W. Young to Standard Oil Development Company.

Coating composition for providing insulating coating of high dielectric strength, comprising solution of 1 to 5 parts by weight of 30,000 to 104,000 molecular weight polybutene as determined by Staudinger method in 10 to 20 parts by weight of volatile organic solvent, 0.2 to 5% based on the weight of said solution, of wetting agent selected from amine acetate salts soluble in polybutene. No. 2,423,761. Hector C. Evans and David W. Young to Standard Oil Development Company.

Coating composition capable of producing corrosion-resistant coating for cartridge cases, comprising alkoxy-substituted urea-formaldehyde condensation product, and extracted pine wood pitch characterized by insolubility in petroleum hydrocarbons and comprising residue low in abietic acid remaining after separation of refined rosin high in abietic

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acid from resinous material obtained by extraction of pine wood with solvent. No: 2,423,872. Oliver P. Clipper to Libbey-Owens-Ford Glass Company.

Forming on ferrous metal fireproof, waterproof, non-sweating, insulating, adherent coating having neutral surface, comprises slowly adding with constant stirring mixture of 1.8 lbs. of silica, 0.125 lb. of calcined dolomite, 0.125 lb. of calcium fluoride, etc. No. 2,424,054. Edward Roach to John U. Birnie.

Phenol-formaldehyde-protein plastic materials for extrusion or injection. No. 2,424,383. Francis E. Calvert to The Drackett Company.

Canadian

Printing ink adapted for rapid drying by evaporation resulting in gelation without passing through the stage of tackiness. No. 443,926. American Can Co. (Herbert J. Wolfe and Paul W. Greubel).

Oleo-resinous metal surface coating composition having improved covering and levelling characteristics and adapted for rapid drying No. 443,927. American Can Co. (Herbert J. Wolfe).

Tastefree, flexible coating composition for sheet metal containers which has high chemical and water resistant properties. No. 443,928. American Can Co. (William F. May).

Dyes, Pigments

Color-yielding element comprising support bearing at least one layer composed of hydrophilic polyamide dye intermediate having plurality of dye intermediate nuclei attached to recurring nitrogen atoms in polyamide chain of atoms, nuclei possessing structure of formula described in patent. No. 2,423,460. David M. McQueen to E. I. du Pont de Nemours & Company.

Disazo dyes from dihydroxy benzidine. No. 2,424,066. Fritz Straub and Jakob Brassel and Peter Pieth to Society of Chemical Industry in Basle.

Production of azo dyestuff images in exposed silver halide emulsion layer which comprises subjecting emulsion to development with solution of beta aromatic sulfonhydrazide in presence of azo dye coupling component. No. 2,424,256. Willy A. Schmidt and Joseph A. Sprung to General Aniline & Film Corporation.

Cyanine dyes which in one of their tautomeric forms have formula described in patent. No. 2,424,483. Edmund B. Middleton and George A. Dawson to E. I. du Pont de Nemours & Company.

Pyrazolone monoazo dyes containing polybasic acid esters of alkylene sulfones. No. 2,424,493. Willy Muller and Jakob Scheidegger to Society of Chemical Industry.

Equipment

Backwashing means for filtering apparatus by reverse flow of filtrate. No. 2,423,172. George Martin Booth to Wallace & Tiernan Co., Inc.

Filter material comprising cloth of deformable material having two series of metal filaments in parallel relationship. No. 2,423,547. Robert A. Behlen to Air-Maze Corporation.

Explosives

In non-detonating deflagrating modified black powder composition, minor proportion of aldehyde and amine condensation product in amount to cause reduction in burning speed of composition. No. 2,423,427. Russell Charrosin Payn and Elwyn Jones and John Stocks to Imperial Chemical Industries, Limited.

In cartridge having primer and main charge, separating means between primer and charge, separating means comprising low melting alloy fusible at below 100°C. No. 2,423,837. Carl A. Martin.

Explosive booster comprising tubular casing open at both ends of narrower diameter at one end than at other, narrower end being adapted to receive detonating component, etc. No. 2,424,374. James Taylor and Harold Reginald Wright to Imperial Chemical Industries, Ltd.

Food

Sterilizing carbohydrate mash comprises heating mash above 212°F but below 300°F in closed pressure heating system, etc. No. 2,423,580. Edwin H. Carnarius to Publicker Industries, Inc.

Composition for improving texture of ice cream comprising water-soluble salt of carboxymethylcellulose and mixed glycerol diester of higher fatty acid and aromatic carboxylic acid. No. 2,423,600. Manfred Landers to Lanco Products Corporation.

Making improved ice cream comprises incorporating mixed glycerol diester of higher fatty acid and aromatic carboxylic acid in unfrozen ice cream mix and subjecting mix to freezing conditions. No. 2,423,613. Bernard Nelson to Lanco Products Corporation.

Concentrating liquids such as fruit juices, beverages, extracts, and infusions comprises continuously flowing liquid at high velocity over heat exchange surface under vacuum, etc. No. 2,423,746. George G. Zahm to Hurd Corporation.

Concentrating liquid food products such as fruit juices, beverages, extracts and infusions, etc. No. 2,423,747. George G. Zahm to Hurd Corporation.

Purifying gelatin comprises treating gelatin in finely divided form with solution of acid in mixture of water and water-miscible organic nonsolvent for gelatin, etc. No. 2,423,773. John Alfred Henry Hart and Edward William Lee to Ilford, Limited.

Making milk fat concentrate of value as intermediate in process of producing butter. No. 2,423,834. Herman C. Horneman, Ralph V. Hussong, Sidney N. Quam and Bernard W. Hammer to Sugar Creek Creamery Company, and Cherry-Burrell Corporation.

In making vinegar, those steps which comprise turbulent circulation through confined space of volume of air substantially in excess of that required for oxidation, etc. No. 2,423,897. John J. Mackin to Leslie J. Kelly.

Producing high yields of riboflavin comprising cultivating under aerobic conditions Candida flareri in growth medium containing fermentable sugar, biotin, assimilable nitrogen, sulphur, phosphorus, and magnesium, and 0.3 to 1.3 micrograms of iron per 100 cc. of medium. No. 2,424,003. Fred W. Tanner, Jr., and James M. Van Lanen.

Inorganic

Recovering substantially pure oxygen and kryptonxenon simultaneously from atmosphere by liquefaction and rectification of air. No. 2,423,274. Claude C. Van Nuys to Air Reduction Company, Inc.

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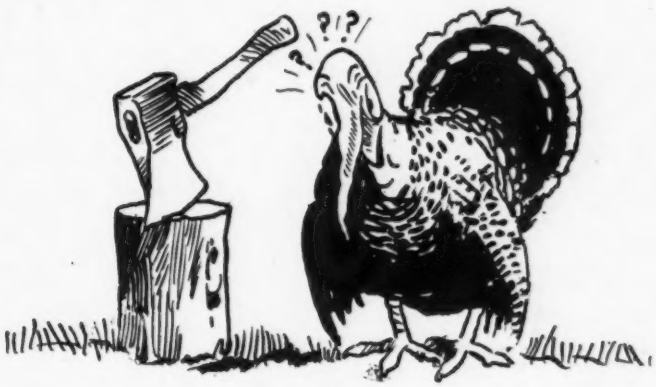
THANKSGIVING

. . . a grand and glorious day for everyone but Mr. Turkey. While we celebrate this day with feasting, let us pause and give thanks for the blessings we enjoy, and for the prosperity and peace of our nation.



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Treating dry finely divided hydrated lime which has been hydrated under super-atmospheric steam pressure and which attains its ultimate properties, including fluid consistency and plasticity, immediately upon mixing with water, which fluid consistency remains the same upon aging with water, to convert hydrate into product in dry powdered form capable of forming gel in admixture with water, etc. No. 2,423,335. Leonard John Minnick to G. & W. H. Corson, Inc.

Separation of air containing high boiling point impurities by rectification at low temperatures wherein compressed cooled gas mixture is separated into impurity-free gas fraction and liquid fraction containing impurities, gas fraction is passed to relatively high pressure rectification zone, liquid fraction is filtered to remove solid impurities, etc. No. 2,423,543. Edward F. Yendall to The Linde Air Products Company.

Apparatus for converting oxygen from liquid to gaseous phase in accordance with variable demand and under pressure. No. 2,423,631. John D. Akerman and Jean F. Piccard to Regents of the University of Minnesota.

Granular absorbent composition consisting of reaction product of 69.74 parts by weight of hydrated lime, 15 parts kieselguhr, 5.25 parts sodium hydroxide, amount of copper compound selected from copper sulphate, copper carbonate, cuprous and cupric chloride equivalent in copper to 10 parts by weight of copper carbonate and water to form paste. No. 2,423,688. Morgan R. Day to Dewey and Almy Chemical Company.

Granular gas absorbent composition consisting of reaction product of 69.75 parts by weight of hydrated lime, 15 parts kieselguhr, 5.25 parts of sodium hydroxide, amount of zinc compound selected from zinc sulphate, zinc chloride and zinc oxide equivalent in zinc to 10 parts by weight of zinc oxide and water to form paste. No. 2,423,689. Morgan R. Day to Dewey and Almy Chemical Company.

In producing ammonium sulfate comprises passing ammonia-containing gas into contact with bath liquor containing sulfuric acid, improvement consists in passing gas beneath surface which slopes downwardly, from point at which it is brought in, at an angle of 4° to 15° to the horizontal, etc. No. 2,423,794. Carl Otto to Fuel Refining Corporation.

Producing anhydrous fluorophosphoric acids comprises mixing any two of compounds selected from H_2PO_4, H_2PO_3F, HPO_2F_2, and POF_3 which have difference of at least two in number of fluorine atoms in their respective molecules. No. 2,423,895. Willy Lange and Ralph Livingston to Ozark-Mahoning Company.

New catalyst consisting of titania gel having apparent density of 0.8 to 1.3 grams per cu. cm. when in 4-12 mesh granules and impregnated with boria. No. 2,424,152. Gerald C. Connolly to Standard Oil Development Company.

Production of sulphate of ammonia crystals in saturator in which bath of sulphuric acid is maintained at bottom of tank and gas space above bath. No. 2,424,205. Carl Otto to Fuel Refining Corporation.

Production of ammonium sulphate crystals by passing distillation gas from coke-oven plants containing ammonia into contact with sulphuric acid bath liquor in saturator having relatively quiescent crystal receiving space at its lower end opening upwardly into the crystal forming and bath space above it, etc. No. 2,424,206. Carl Otto to Fuel Refining Corporation.

Production of ammonium sulphate crystals by passing ammonia containing gas into contact with sulphuric acid bath liquor in saturator having crystal receiving space at its lower end opening upwardly into crystal forming and bath space about it and having adjustable obturator within and adjacent lower end of saturator, etc. No. 2,424,207. Carl Otto.

Apparatus for setting in course of travel of inorganic oxide hydrosol into hydrogel, sizing hydrogel, distributing same into washing trays. No. 2,424,232. William H. Gabeler to The Davison Chemical Corporation.

Coordinated zirconyl and hafnyl compounds and their production. No. 2,424,262. Eugen Wainer to The Titanium Alloy Manufacturing Company.

Apparatus for growing crystals in solution comprising substantially rectangular tank for receiving supply of crystallizing solution, means rockably supporting tank, baffle means within tank in parallel relation to bottom of tank, etc. No. 2,424,273. Walter O. Haas, Jr., to Western Electric Company, Incorporated.

Horixontal rotary sulfur vaporizer. No. 2,424,336. August T. Sieron to General Chemical Company.

Electrolytic production of permanganate comprises electrolyzing in first bath of concentrated aqueous solution of hydroxide selected from alkali metal hydroxides and alkaline earth metal hydroxides between anode composed of ferro-manganese containing 80% manganese and cathode until manganate and other compounds are precipitated in solid form, etc. No. 2,424,392. Uscha Gottesmann and Hirsch Lowenstein.

Apparatus for producing metallic potassium by treatment of solid inorganic potassium compound with sodium above melting point of sodium. No. 2,424,399. Charles A. Kraus and Aldo Spencer Lehmann and Charles L. Morris and Charles R. Witschonke.

Dehydrating hydrous synthetic catalyst of gel structure produced from aqueous sol. No. 2,424,467. Everett A. Johnson to Standard Oil Company.

Burning-vaporizing sulfur by procedure in which sulfur is fed in solid form to burning-vaporizing zone thru sulfur feed conduit. No. 2,424,495. Julius Worth Neelley to General Chemical Company.

Recovering one of substances of group consisting of alkali metals lithium, rubidium and cesium and their oxides by direct distillation from their silicate and phosphate ores. No. 2,424,512. Robert A. Stauffer to National Research Corporation.

Canadian

Generation of chlorine dioxide. No. 443,856 to 443,861. The Mathieson Alkali Works (Gregory A. Petroe).

Potassium compound separation and recovery from magnesium bisulphite cooking liquor. No. 443,995. Weyerhaeuser Timber Co. (Raymond S. Hatch).

Decomposition of ammonium dithionate in an ammonium sulphate solution by acidifying and heating the solution under pressure. No. 444,055. The Consolidated Mining and Smelting Company of Canada, Ltd. (Gerald Stanley Ortner and Joseph Newton Robinson).

Process for the manufacture of sodium bicarbonate in a very fine state of division. No. 444,107. (Walter McGeorge and Francis Highland Miner).

Manufacturing chlorsulphonic acid by reacting sodium chloride with sulphur trioxide-containing gas mixture which issues from the converter of a contact sulphuric acid plant, and distilling the resulting compound with fuming sulphuric acid. No. 444,144. American Cyanamid Co. (Napoleon Arthur Laury).

Improved process for coating pebbled ammonium nitrate with finely divided dolomite. No. 444,191. The Solvay Process Co. (Richard C. Datin).

Method of producing sodium bicarbonate. No. 444,328. (John Ross Taylor).

In the production of soda ash, the method of recovering ammonia from filter liquor. No. 444,329. (John Ross Taylor).

Method of absorbing ammonia in brine liquor. No. 444,330. (John Ross Taylor).

A method of producing soda ash. No. 444,331. (John Ross Taylor).

Medicinal

Therapeutic preparation comprising as primary therapeutically active constituent at least one member of class of N³-carboxyacylmetanilamides and carboxylates thereof. No. 2,423,108. Maurice L. Moore and Tony M. Immediata to Sharp & Dohme.

In closed ampoule of type having at least one tapered point and containing radio-activated injection liquid, insoluble body of radon producing substance secured within interior of ampoule in contact with liquid for activating liquid. No. 2,423,240. Stefan Klinghoffer.

Forming surgical dressing which may be implanted in living animal bodies and be absorbed by body fluids, comprising incorporating intra-blood medicament into pores of material consisting of starch and having structural form of sponge. No. 2,423,475. Claude W. Brice and Majel M. MacMasters.

Surgical fabric consisting of woven threads of uniformly oxidized cellulose fibers. No. 2,423,707. William O. Kenyon and Cornelius C. Unruh to Eastman Kodak Company.

Producing highly potent circulatory hormone preparation having peripheral vasodilatory action and being substantially free from physiologically significant amounts of petone, insulin, histamine, choline, adenosine, adenylic acid and other deleterious impurities. No. 2,424,401. Alex Lesuk to Winthrop Chemical Company, Inc.

Metals, Ores

Agglomeration by sulfonated reagents in magnetic recovery of iron ores. No. 2,423,314. Earl Conrad Herkenhoff to American Cyanamid Company.

Improved process of degreasing surfaces of light metals of group consisting of aluminum and magnesium with chlorinated hydrocarbon solvents of group consisting of carbon tetrachloride trichlorethylene, ethylene chloride, chloroform and pentachlorethane. No. 2,423,343. Edwin P. Plueddemann and Richard Rathman to Westvaco Chlorine Products Corporation.

Pickling ferrous material comprises, contacting material with hydrochloric acid solution derived from thermal decomposition of hydrated magnesium chloride, etc. No. 2,423,385. Arthur W. Hixson and Ralph Miller, to The Chemical Foundation, Inc.

Improvement in froth flotation process, comprises delivering quantity of pulp from preceding stage to succeeding stage in excess of quantity of initial feed thereby raising liquid level in succeeding stage above level in preceding stage, etc. No. 2,423,456. Leland H. Logue to Mining Process and Patent Company.

Preparing electrolyte for electrodeposition of indium comprises, dissolving tartaric acid in water to make concentrated solution, dissolving compound of indium in said solution adding water and ammonium hydroxide. No. 2,423,624. Clarence F. Smart to General Motors Corporation.

Corrosion resistant alloy of improved crystalline and structural properties comprising Ni 27-30%, Cr 19-22%, Cu 2.0-3.0%, Si 2.0-about 3.0%, Mo 1.45-about 1.95%, C 0.1%, Mn 5-2.0%, and remainder Fe ratio of Si to Mo being greater than one. No. 2,423,665. William B. Sullivan and John W. Jupenlatz to Lebanon Steel Foundry.

Apparatus for breaking crust in metal-producing electrolytic cell containing suspended electrode. No. 2,423,787. Roscoe Lee Mosen, George Hamilton Traylor and Robert Lee Haislip and Alvin Earl Hall to Aluminum Company of America.

Welding one metal slab to another to form bimetal comprises hermetically boxing slabs with face of one in welding relation to that of the other in sheet metal container having longitudinal and transverse side walls jointly surrounding edges of both slabs, etc. No. 2,423,810. Joseph M. Goulding to Revere Copper and Brass Incorporated.

Improving physical characteristics of composite bearing stock consisting of supporting back of strong metal having sprayed metal layer thereon which layer includes high percentage of copper. No. 2,423,857. Charles Robert Talmage to General Motors Corporation.

Corrosion-preventive composition comprising neutral vehicle and finely dispersed therein corrosion inhibiting amount of phenylene bis sulfide dicarboxylic acid. No. 2,423,865. Ellis Ross White to Shell Development Company.

Device for measuring the level of a molten metal bath. No. 2,423,888. Frank A. Hueser to Western Electric Company, Incorporated.

Tinplate brightening apparatus. No. 2,424,034. Edward William Hopper to Crucible Steel Company of America.

Continuously electroplating uniform brass coating upon metallic strand. No. 2,424,173. Kenneth M. Huston and Vincent A. Rayburn to Western Electric Company, Incorporated.

Purifying liquid light metal recovered from mixed salt bath more dense than metal, improvement comprises collecting metal in hood beneath upper surface of bath, passing collected crude metal very slowly through body of metal which is relatively quiescent and at high temperature which permits settling out of salt particles in preliminary purification, etc. No. 2,424,179. Robert J. McNitt.

Treating marmatitic zinc ores and concentrates containing sulphides of manganese and other metal consists in leaching ores and concentrates with HCl in hot concentrated $MgCl_2$ solution to dissolve soluble sulphide minerals, etc. No. 2,424,351. Niels C. Christensen to Combined Metals Reduction Company.

Effecting concentration of sulfide ore by flotation comprises subjecting mineral pulp containing sulfide ore to flotation operation in presence of phosphorus and sulfur-containing reaction product of phosphorus sulfide and olefin. No. 2,424,402. Clarence M. Loane and James W. Gaynor to Standard Oil Company.

Electrodeposition of metallic tin comprises passing electric current from anode to cathode and through electrolytic bath comprising water, potassium stannate at concentration between 0.25 and 3.0 mols per liter and free potassium hydroxide at concentration between 0.15 and 3.5 mols per liter, etc. No. 2,424,472. Frederick A. Lowenheim and Martin M. Sternfels to Metal and Thermit Corporation.

Canadian

Method of reclaiming spent pickling solutions by precipitating the sulphate contained in the solution. No. 443,804. (Willard Wellington Hodge).

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* *U. S. Patents from Vol. 599, Nos. 1, 2, 3, 4. Canadian from July 29 - August 19, 1947.*

Method of uniformly colouring an aluminum article having an oxide coating anodically produced in strong acid electrolyte. No. 444,042. Aluminum Company of America. (Edward Vernon Balckmun).

Concentrating sylvite, in the form of a mixture of the finer and coarser particles, from crushing the ore by froth-flotation treatment. No. 444,182. Minerals Separation North American Corp. (Ernest W. Greene and Allen T. Cole).

Organic

Preparing aryl acrylates comprises pyrolyzing corresponding aryl ester of alpha-acetoxy-propionic acid at 400° to 600°C. No. 2,423,089. Edward M. Filachione and Charles H. Fisher.

Ethylene glycol-isopropylene glycol-sebacic acid-aconitic acid polyester, aconitic acid entering into polyester constituting between 025 mol % and 5 mol % of total sebacic acid and aconitic acid. No. 2,423,093. Carl J. Frosch to Bell Telephone Laboratories, Incorporated.

Reaction product of phenyl mercury salts with hydroxy alkyl amino compounds and their preparation. No. 2,423,121. Frank J. Sowa.

Making chlorinated furane resins, step of adding chlorine to furfural-containing liquid in presence of caustic alkali. No. 2,423,139. John Delmonte.

Subjecting hydrocarbon to conversion in presence of catalyst comprising mechanical mixture of porous supporting material and sublimed molybdenum oxide. No. 2,423,163. Charles L. Thomas to Universal Oil Products Company.

Concentrating conjugated dienes containing fewer than seven carbon atoms from mixtures containing them in small proportions in order of 2% to 5%. No. 2,423,179. Thomas F. Doumani, Roland Deery and Art C. McKinnis to Union Oil Company of California.

Reduction of nitronaphthenes comprises passing two streams, one of which is gaseous stream comprising hydrogen and other is water, through body of liquid nitronaphthene, etc. No. 2,423,180. Thomas F. Doumani and Clarence S. Coe to Union Oil Company of California.

Conditioning catalyst for reacting hydrocyanic acid with acetylene in vapor phase to produce vinyl cyanide catalyst comprising solid, porous granular material impregnated with mixture of sodium and potassium cyanides. No. 2,423,186. Charles R. Harris and Wilbur W. De Atley to E. I. du Pont de Nemours & Company.

Manufacture of lactams, comprises heating under reflux mixture of sulphuric acid with 2 to 3 times its volume of acetic acid, adding to heated mixture oxime of saturated aliphatic cyclic ketone at such rate that heat of reaction evolved causes acetic acid to boil from mixture. No. 2,423,200. Robert Wighton Moncrieff and Donald Peter Young to British Celanese Limited.

Polycyclic diketopyrimidines characterized by formula described in patent. No. 2,423,218. Alfred W. Anish to General Aniline & Film Corporation.

Preparing cis-3,6-endomethylene, delta 4 tetra-hydrophthalic anhydride comprises heating to 180 to 200°C mixture of dicyclopentadiene and maleic anhydride in common inert organic solvent in autoclave for 30 to 60 minutes. No. 2,423,234. Howard L. Gerhart and Leon M. Adams to Pittsburgh Plate Glass Company.

Manufacture of thiuram disulfides N-substituted symmetrically by only two organic radicals chosen from alkyl radicals containing from 1 to 5 carbon atoms, phenyl radicals and benzyl radicals. No. 2,423,310. Leslie A. Gillette to Sharples Chemical, Inc.

Preparation of vinyl cyanide by reaction of hydrogen cyanide with acetylene in presence of aqueous solution of cuprous chloride complex, improvement whereby acidity of catalyst solution is maintained at pH not exceeding 4 by means of water-soluble aliphatic polycarboxylic acid. No. 2,423,318. Benjamin Wilson Howk to E. I. du Pont de Nemours & Company.

Dithioglycerol composition containing as thermal stabilizer therefor member of class consisting of ammonia, ammonium salts, and carbonamides. No. 2,423,344. George Wayne Rigby to E. I. du Pont de Nemours & Company.

Polymethylene diguanamines. No. 2,423,353. Jack Theo Thurston to American Cyanamid Company.

Benzenediazonium fluosilicate. No. 2,423,359. Richard Haven Wiley to E. I. du Pont de Nemours & Company.

Sub-resinous esterified adduct, being member selected from class consisting of complete esters, acid esters, and ester salts. No. 2,423,365. Charles M. Blair, Jr. to Petrolite Corporation, Ltd.

Cyclic process for production of dienes with substantial yields of resin-forming aromatic hydrocarbons and non-resin forming aromatic hydrocarbons. No. 2,423,375. Newcomb K. Chaney and Edwin L. Hall to The United Gas Improvement Company.

Purifying styrene in admixture with phenyl acetylene. No. 2,423,388. Claude W. Jordan to The United Gas Improvement Company.

Purifying aryl olefine having styrene structure as nucleus contained in mixture which also contains at least one acetylenic compound of similar boiling point and having hydrogen atom attached to carbon atom of triple bond and at least one aldehyde of similar boiling point. No. 2,423,389. Claude W. Jordan to The United Gas Improvement Company.

Separation of styrene from mixture containing styrene and xylene comprises admixing acetic acid with mixture, distilling resulting admixture. No. 2,423,412. Edward H. Smoker to The United Gas Improvement Company.

Production of indene phenol from indene. No. 2,423,415. Frank J. Soday to The United Gas Improvement Company.

Production of alkadienes from alkenes. No. 2,423,418. Charles M. Stone and Karl J. Korpi to The Texas Company.

Residual tar separated from tar-water emulsion produced during condensation in presence of H2O of products of vapor phase pyrolysis at average temperatures above approximately 1300°F of petroleum oil, etc. No. 2,423,424. Edwin L. Hall and Howard R. Batchelder to The United Gas Improvement Company.

Alkylation of acyclic organic compound with alkylation agent using hydrogen fluoride as catalyst. No. 2,423,470. Joseph H. Simons to E. I. du Pont de Nemours & Company.

Production of products having recurring arylethylene units with termini from a saturated halogenated alkane. No. 2,423,497. Jesse Harmon to E. I. du Pont de Nemours & Company.

3-keto-20,21-dihydroxy saturated pregnane compounds. No. 2,423,517. Tadeus Reichstein to Roche Organon, Inc.

Photopolymerization of vinylidene compounds in presence of N-disubstituted dithiocarbamic esters. No. 2,423,520. Lawrence Marion Richards to E. I. du Pont de Nemours & Company.

Synthesizing alkyl benzenes comprises reacting benzene with compound selected from aliphatic mercaptans and alkyl sulfides at 100°-400°C in presence of Friedel-Crafts catalyst. No. 2,423,530. Carlisle M. Thacker and Ralph C. Swann to The Pure Oil Company.

Substituted 4-amino-4'-lower-alkoxy azobenzene in which 4-amino group is primary and in which substituents apart from 4-amino group and 4'-alkoxy group are selected from lower alkyl, lower alkoxy, halogen, and acidylamino, each of at least three of substituents being in ortho position to azo group. No. 2,423,542. John Wright to British Celanese Limited.

Esterifying terpene alcohol with diacyl anhydride of acetic acid under conditions such that free acetic acid is formed as by-product. No. 2,423,545. Max E. Aeschbach to Norda Essential Oil & Chemical Company, Inc.

Composition consisting of urea and potassium formate in molecular ratio within range of 2 to 6 mols of potassium formate to each 3 mols of urea. No. 2,423,556. Richard Feibelmann to Heyden Chemical Corporation.

Production of acetylsalicylic acid comprises reaction of acetylsalicylic-acetic anhydride with anhydrous acetic acid. No. 2,423,569. Herman Sokol to Heyden Chemical Corporation.

Naphtholsulfonamidobenzaldehydes and acetals thereof. No. 2,423,572. David W. Woodward to E. I. du Pont de Nemours & Company.

Production of alpha-methallyl alcohol comprises reacting butadiene with member of group consisting of hydrogen chloride and hydrogen bromide. No. 2,423,599. Jonas Kamlet to Publicker Industries Inc.

Preparation of thiol esters comprises reacting thiolacetic acid in neutral to acid liquid environment at −50°C to 200°C. with vinyl ester of the class consisting of vinyl chloride, vinyl acetate, and vinyl thiolacetate in presence of catalyst containing two directly linked oxygen atoms, selected from peroxides and molecular oxygen. No. 2,423,641. Ellsworth Knowlton Ellingboe to E. I. du Pont de Nemours & Company.

Condensation products of guanylurea with alkylene oxides. No. 2,423,643. Walter P. Ericks to American Cyanamid Company.

Normal secondary nonadecyl sulphate. No. 2,423,692. Emil E. Dreger and John Ross to Colgate-Palmolive-Peet Company.

4-Aryl thiazole (and selenazole)–5–acetic acids and esters and process of producing. No. 2,423,709. Edward B. Knott to Eastman Kodak Company.

Acylamino phenols. No. 2,423,730. Ilmari F. Salminen and Arnold Weissberger to Eastman Kodak Company.

Recovering aliphatic hydrocarbons and acetone from distillate product of an extractive distillation system employing acetone as solvent in treatment of complex hydrocarbon mixture. No. 2,423,795. John A. Patterson to Standard Oil Development Company.

Separating alpha methyl styrene from mixture containing cumene. No. 2,423,802. Ober C. Slotterbeck and Charles E. Morrell to Standard Oil Development Company.

Preparing menthenetriol comprises reacting terpinolene in alkaline medium having pH of 7.5 to 13 with water and gas containing free oxygen. No. 2,423,854. John E. Reese to Hercules Powder Company.

Production of acetic acid comprises reacting ethane and oxygen in presence of hydrogen bromide and 100°C-200°C effecting reaction under deliberate influence of ultra-violet rays having wave-lengths below 3000 Angstrom units. No. 2,423,949. Frederick F. Rust and William E. Vaughan to Shell Development Company.

Producing butadiene comprises vaporizing ethanol, passing vapors thereof over catalyst comprising zinc oxide modified with zinc salt selected from silicate, phosphate, and tungstate, while maintaining catalyst at 375°C–500°C. to form gaseous mixture, etc. No. 2,423,951. LeRoy U. Spence and Darrel J. Butterbaugh to Rohm & Haas Company.

Oleyl ester of sulfobenzoic acid in which oleyl group is attached to carboxy group. No. 2,423,972. Earl W. Gluesenkamp and Milton Kosmin to Monsanto Chemical Company.

N'-benzoylsulfonamide having formula described in patent. No. 2,423,976. Martin Everett Hultquist and Elmore Hathaway Northey to American Cyanamid Company.

2-omega-carbalkoxy alkyl-3-oxo-4-carbalkoxy tetrahydrothiophene. No. 2,424,007. Marjorie B. Moore and Edmond E. Moore to Abbott Laboratories.

9-Amino-alkyl-amino-substituted acridine derivatives. No. 2,424,061. Horace A. Shonle and Joseph W. Corse to Eli Lilly and Company.

2-methoxy-6-chlor-9-(4'-(diisopropylamino)-butylamino-acridine having formula described in patent. No. 2,424,062. Horace A. Shonle and Joseph W. Corse to Eli Lilly and Company.

2-methoxy-6-chloro-9-2'-hydroxy-3'-(ethyl-n-butylamino)-propylaminol-acridine having formula described in patent. No. 2,424,063. Horace A. Shonle and Joseph W. Corse to Eli Lilly and Company.

Tall oil ester resin prepared by heating tall oil with polymerized ester of carboxylic acid and aliphatic unsaturated monohydric alcohol containing olefinic linkage between beta and gamma carbon atoms. No. 2,424,074. Franklin A. Bent and Elbert A. Peterson to Shell Development Company.

Production of ethylene oxide by direct catalytic oxidation of ethylene. No. 2,424,084. Harry de V. Finch and Ingolfur Bergsteinsson to Shell Development Company.

Production of ethylene oxide by direct catalytic oxidation of ethylene. No. 2,424,086. Ingolfur Bergsteinsson and Harry de V. Finch to Shell Development Company.

Manufacturing 1,4-substituted pentanes. No. 2,424,184. Samuel A. Morell.

Continuous process for selective removal of isobutylene from hydrocarbon mixtures containing paraffins, secondary and tertiary olefins. No. 2,424,186. John W. Packie and Walter H. Rupp to Standard Oil Development Company.

Protecting organic material subject to attack by organisms comprises treating material with halogenated 1,3-epoxyarylofurazane. No. 2,424,199. William Porter Horst to United States Rubber Company.

Making esters of 7,8-diamino nonoic acid. No. 2,424,311. Stanton A. Harris to Merck & Co., Inc.

Member of group consisting of 4:4'-diamidinoalpha,gama-diphenoxypropane-dibeta-hydroxy-ethane-sulphonate and 4:4'-diamidino-alpha,epsilon-diphenoxypentane-di-beta-hydroxy-ethane-sulphonate. No. 2,424,325. George Newbery and Alexander Peter Tawse Easson to May & Baker Limited.

Tetrabutyryl ribonic acid. No. 2,424,341. Max Tishler to Merck & Co., Inc.

Solvent extraction of organic sulphonyl halides. No. 2,424,420. John Ross and Dwight James Potter to Colgate-Palmolive-Peet Company.

New alcohol consisting of pentaerythritol nucleus, two carbons of which carry unchanged hydroxyls, two carbons being linked through oxygen to two glycerine nuclei remaining carbons of which carry ester groups consisting of acid nucleus of maleic-anhydride-modified-rosin. No. 2,424,424. Howard C. Woodruff.

Manufacture of halogen substituted arminoaryl-sulphonic acid, comprising aralkylating 4-amino-4'-amyl-1,1'-diphenylether-2-sulphic acid by reacting same with 2,3,4,6-tetrachlorobenzyl-chloride. No. 2,424,477. Henry Martin, Hans Heinrich Zaeslin and Rudolf Hirt and Alfred Staub to J. R. Geigy A. G.

Production of beta-nitroethanol and beta-nitro-ethyl nitrate. No. 2,424,510. Arthur Ernest Wilder Smith, Charles William Scaife and Robert Holroyd Stanley to Imperial Chemical Industries Limited.

Complex lead phthalate-containing compositions and process for preparing. No. 2,424,515. Alexander Stewart, Adrian R. Pitrot and Leonard M. Kebrich to National Lead Company.

Additional patents from the above volumes will be given next month.

Trademarks of the Month

A Checklist of Chemical and Chemical Specialties Trademarks

431,069. Greever's, Inc., Chilhowie, Va.; filed Dec. 13, 1945; Serial No. 493,187; for insecticides; since Sept. 1, 1945.

431,126. Tru Test Laboratories, Inc., Philadelphia, Pa., filed Sept. 15, 1944; Serial No. 474,250; for chemical reagents for making analytical tests and determinations of boiler water, sewage, soil, coal; since May 3, 1944.

431,133. Nova Chemical Corporation, New York, N. Y.; filed Jan. 25, 1946; Serial No. 495,402, for dyestuffs and pigment colors for coloring textiles, leathers and papers; since Jan. 9, 1946.

431,135. Eugene Blazier, Sr., Vancouver, Wash.; filed Mar. 4, 1946; Serial No. 497,589; for liquid chemical for use as wood preserver and fire retardant; since Feb. 18, 1946.

431,138. Thompson-Hayward Chemical Company, Kansas City, Mo., filed Apr. 15, 1946, Serial No. 500,261; for herbicide; since Sept. 14, 1945.

431,155. The Hall-Watson Company, Inc., New York, N. Y.; filed Aug. 9, 1946; Serial No. 507,123; for chemical addition to fuel oil; since Apr. 8, 1946.

431,156. Hinson & Company, Richmond, Ind., filed Aug. 7, 1946; Serial No. 507,772; for dry cleaner, pore filler polish and waxing composition; since Nov. 1, 1944.

488,859. I. F. Laucks, Inc., Seattle, Wash., assignor to Monsanto Chemical Company, Seattle, Wash.; filed Sept. 22, 1945; for insecticide in powdered and liquid form; since Jan. 19, 1945.

489,114. Gold Leaf and Metallic Powders Co., New York, N. Y., assignor to Gold Leaf and Metallic Powders, Inc., New York, N. Y., filed Sept. 28, 1945; for bronze powder, aluminum powder, copper powder, magnesium powder, metals of all types in powdered form; since Aug 1, 1944.

492,513. The Pennsylvania Salt Manufacturing Company, Philadelphia, Pa., filed Dec. 1, 1945; for insecticides; since July 26, 1945.

493,669. Elgin Softener Corporation, Elgin, Ill.; filed Dec. 21, 1945; for graded siliceous and other insoluble, unreactive granular materials; since Jan. 2, 1945.

493,842. Southwestern D D T Corporation, Dallas, Tex., filed Dec. 22, 1945; for insecticide; since Dec. 1, 1945.

495,461. Evans Chemetics, Inc., New York, N. Y.; filed Jan. 26, 1946; for namely, thioglycerol; since Aug. 9, 1945.

495,553. Monarch Chemical Company, New Orleans, La., filed Jan. 28, 1946; for insecticides; since Oct. 8, 1945.

498,298. Midland Laboratories, Dubuque, Iowa, filed Mar. 15, 1946; for insecticides, liquid shampoo soaps, pipe and drain cleaners, hospital disinfectants and germicides; since on or about Mar. 4, 1946.

499,072. Plant Products Corporation, Blue Point, New York, filed Mar. 27, 1946; for insecticide containing compounds useful as fertilizer; since Feb. 23, 1945.

500,072. Gallowhur Chemical Corporation, Reading, Vt., and New York, N. Y., assignor to Gallowhur Chemical Corporation; filed Apr. 12, 1946; for insecticides, germicides, disinfectants, and deodorants; since Jan. 23, 1946.

500,212. General Molded Products, Inc., Des Plaines, Ill., filed Apr. 15, 1946; for molded plastic industrial products; since Aug. 1, 1940.

500,358. Blackman-Uhler Co., Spartanburg, S. C., filed Apr. 17, 1946; for chemical cleaning preparation, for removing lint, dust from cotton picking machines; since Aug. 5, 1945.

501,469. National Oil Products Company, Harrison, N. J., now Nopco Chemical Company, Harrison, N. J., filed May 4, 1946; for wetting agent for pigments; since Nov. 19, 1940.

501,731. General Aniline & Film Corporation, New York, N. Y.; filed May 9, 1946; for nonionic chemical liquid detergents; since April 2, 1946.

503,611. H. Steeley Cia., S. A. Mexico City, Mexico, filed June 10, 1946; for printing ink, writing ink, ink oils, carbon paper, etc., since June 15, 1945.

503,980. Dow Corning Corporation, Midland, Mich., filed June 15, 1946; for compositions consisting of or containing organo polysiloxanes to render materials water-repellent; since February 1945.

504,351. Stanley A. Germain as Sultech Distributing Co., Glendale, Calif., filed June 21, 1946; for fertilizers; since Feb. 20, 1946.

504,791. Riley & Geehr, Inc., Chicago, Ill., filed June 28, 1946; for plastic masking compounds; since June 17, 1946.

506,787. Thompson Chemical Company, Pawtucket, R. I., filed Aug. 2, 1946; valve-grinding compounds; since Oct. 31, 1924.

507,041. Calgon, Incorporated, Pittsburgh, Pa., filed Aug. 8, 1946; for detergent chemical compound used in washing transportation equipment, since Aug. 2, 1946.

507,813. Fischer Industries, Inc., Cincinnati, Ohio, filed Aug. 22, 1946; for cleaning powder for aluminum, aluminum plate, and aluminum finishes; since Oct. 1, 1939.

507,872. Wyandotte Chemicals Corp., Wyandotte, Mich., filed Aug. 22, 1946; for alkaline detergent composition; since Mar. 8, 1938.

508,132. Standard Oil Co. of New Jersey, Wilmington, Del., filed Aug. 27, 1946; for antioxidant for rubber; since July 24, 1946.

508,231. Monsanto Chemical Co., St. Louis, Mo., filed Aug. 29, 1946; for chemical products for use as insecticides, fungicides, mildew-proofing agents; since Aug. 10, 1946.

508,428. A. Arthur Jaffe, as Mighty Foam Co., Scranton, Pa., filed Sept. 3, 1946; for cleaning preparations for cleaning upholstery and rugs; since July 10, 1946.

508,807. Omni Products Corp., New York, N. Y., filed Sept. 10, 1946; for thermoplastic molding compounds, cast resins, oil soluble resins; since 1942.

508,810. Onyx Oil & Chemical Co., Jersey City, N. J.; filed Sept. 10, 1946; for synthetic detergent, which is also wetting and foaming agent; since Aug. 7, 1946.

508,824. Sun Oil Company, Philadelphia, Pa., filed Sept. 10, 1946; for plasticizer for rubber, since May 15, 1946.

509,532. The Pennsylvania Salt Manufacturing Company, Philadelphia, Pa., filed Sept. 21, 1946; for insecticides; since Apr. 22, 1946.

509,533. The Pennsylvania Salt Mfg. Co., Philadelphia, Pa., filed Sept. 21, 1946; for herbicides; since Aug. 5, 1946.

510,214. Standard Alcohol Co., Wilmington, Del., and New York, N. Y.; filed Oct. 3, 1946; for solvent material for use in manufacture of inks; since Dec. 22, 1919.

510,422. Celanese Corporation of America, New York, N. Y.; filed Oct. 8, 1946; for sheets, films, etc., capable of being molded under heat and/or pressure; since about Sept. 28, 1946.

511,062. California Spray - Chemical Corp., Wilmington, Del., and Richmond, Calif., filed Oct. 18, 1946; for parasiticides; since Sept. 18, 1946.

511,063. California Spray - Chemical Corp., Wilmington, Del., and Richmond, Calif., filed Oct. 18, 1946; for parasiticides; since Sept. 18, 1946.

511,806. Petrus Jacobus Geerlings as Geerlings Feed Mills, Waterloo, Iowa, filed Oct. 31, 1946; for commercial fertilizers; since 1944.

515,679. George L. Phillips as Phillips Plastic Co., Newkirk, Okla., filed Jan. 13, 1946; for adhesive cement; since Dec. 19, 1945.

517,949. The American Fluresit Co., Cincinnati, Ohio; filed Feb. 24, 1946; for hydraulic compounds for coating surfaces of masonry structures; since June 1941.

517,950. The American Fluresit Co., Cincinnati, Ohio, filed Feb. 24, 1946; for hydraulic cement base or compounds; since Jan. 1944.

431,069

431,126

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431,133

NO-BLAZE
431,135

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493,669

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509,533

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510,214

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510,422

GAMTONE
511,062

GAMMATONE
511,063

TAILORMADE
511,806

515,679

FLURESEAL
517,949

FLURETEX
517,950

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33. Cargille Scientific Co.	880
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38. Chemical Service Corp.	917
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131. Mutual Chemical Co. of America	749
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133. National Box & Lumber Co.	863
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155. Richold Chemicals, Inc.	879
156. Reilly Tar & Chemical Corp.	838
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159. Robert & Co.	919
160. Rohm & Haas Co.	757
161. Rosenthal-Bercow Co.	919
162. St. Regis Paper Co.	860, 861
163. Saranac Machine Co.	908
164. Sargent & Co., E. H.	910
165. Sharples Corporation, The	857
166. Sharples Chemicals, Inc.	Insert between pages 760 & 761
167. Shell Chemical Corp.	881
168. Signode Steel Strapping Co.	859
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170. Solvay Sales Corp.	Inside Front Cover
171. Sparkler Mfg. Co.	872
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174. Standard Oil Co., Indiana	843
175. Standard Silicate Division of Diamond Alkali	768
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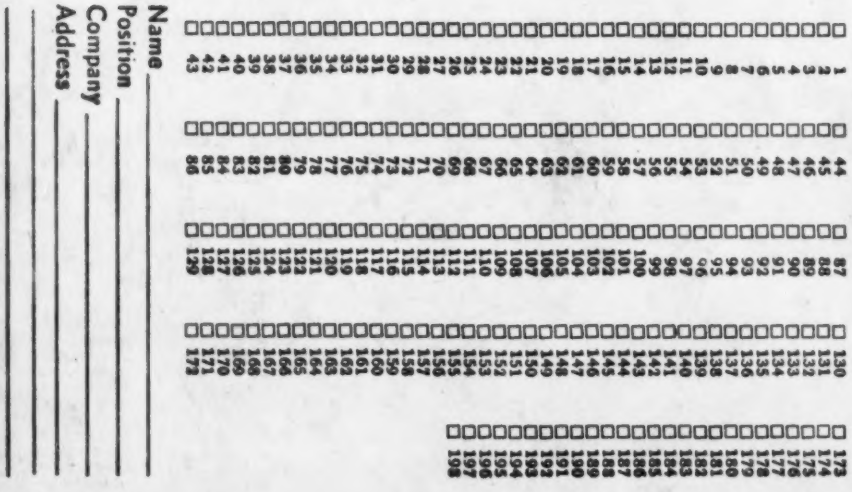

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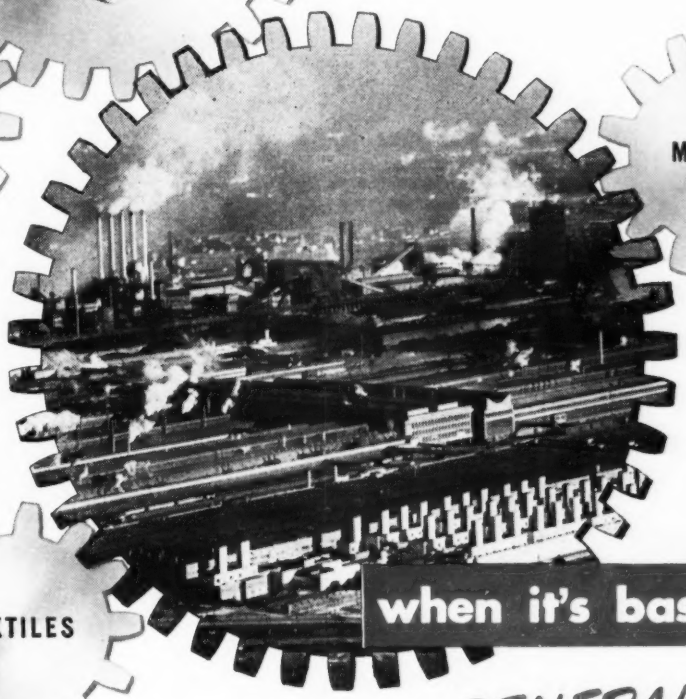

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